Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

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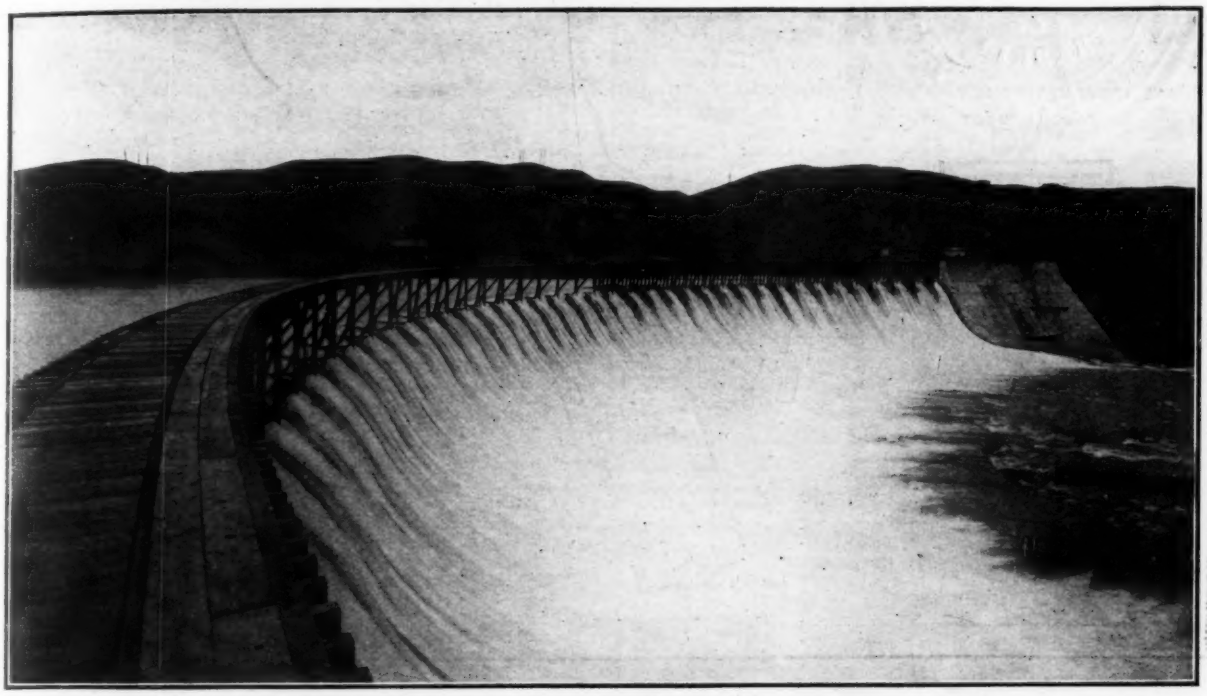


Montana Power Company's Dam at Volta, Near Great Falls.

Montana Power Company's System

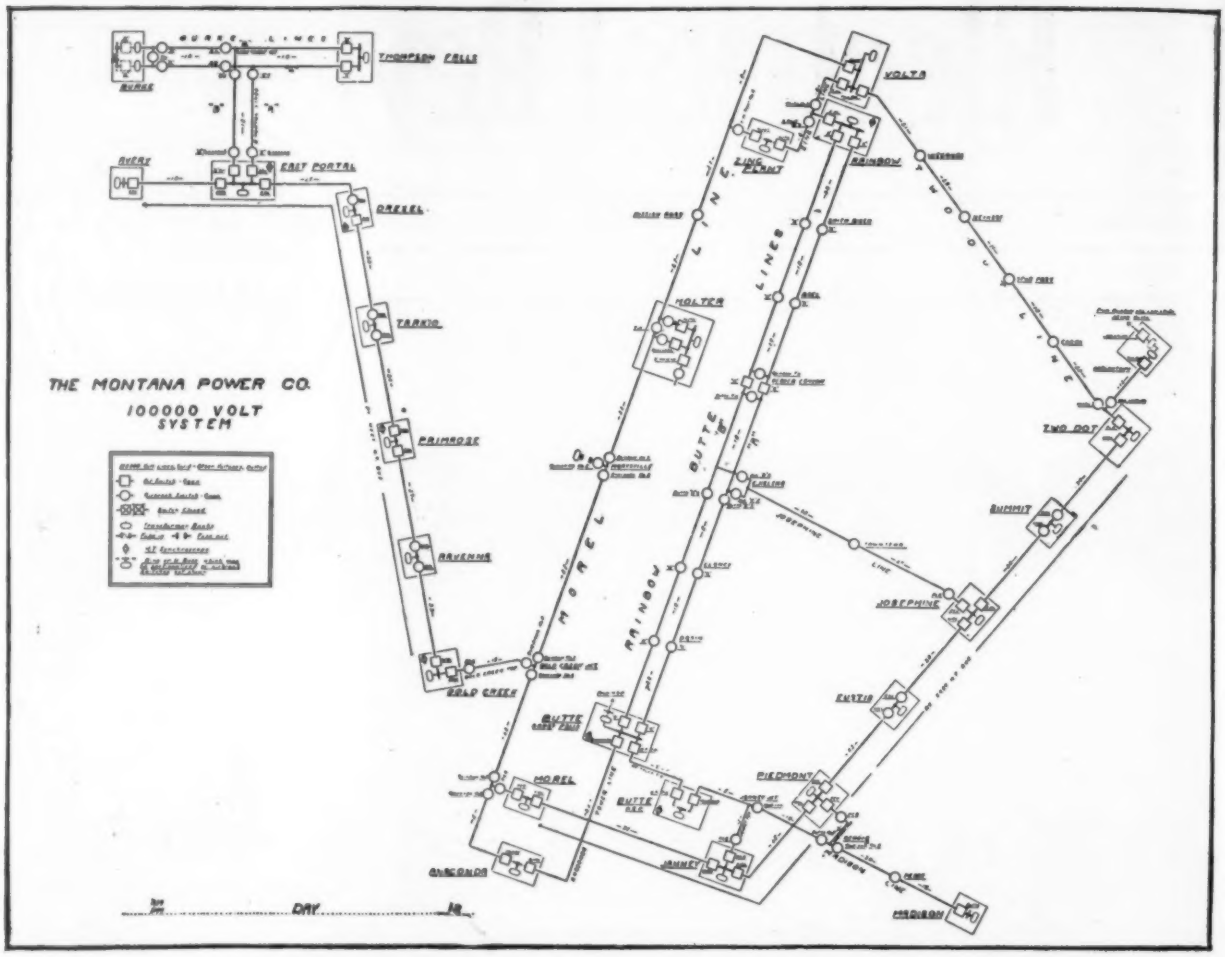
Many Hydroelectric Plants Interconnected, With Combined Generating Capacity of Over 200,000 Kilowatts—Essential Features of Each Plant—Notes on Transmission Lines and Service

By W. A. SCOTT

A VISUALIZATION of the Montana Power Company's utilities discloses 13 hydroelectric and four steam-electric plants, all tied together in one comprehensive system by means of numerous substations and over 1,800 miles of transmission lines. The hydroelectric plants in operation have a combined generating capacity of 171,530 kilowatts, and the Holter plant which is to be completed this year, will bring into the system 40,000 kilowatts more. The steam-driven plants have an aggregate capacity of 5,920 kilowatts. Thus, by the close of 1917 the company's power-producing plants will be equal to 217,450 kilowatts. The system reaches from Billings, on the east, to Thompson Falls and Montana-Idaho state line on the west; from Havre on the north to Ruby and Alder creek on the south; and supplies power to a territory 250 miles north-south by 400 miles east-west. All hydroelectric plants are situated on the Missouri River and its tributaries, except the plant at Thompson Falls, which is on the Clark fork of the Columbia, in western Montana. Those on the Missouri and its branches are closely interconnected as a power-service system, while the Thompson Falls plant and its substations are tied to the main Butte-Great Falls system only through the C. M. & St. Paul electric railway line. The transmission of power is by means of 340 miles of steel tower lines, 635 miles of pin-type pole lines, 513 miles of suspension-insulator-type pole lines, and 375 miles of two-pole bridge-type lines.

MANY PLANTS INTERCONNECTED.

This system of the Montana Power Company is the result of the merging of a number of power-serv-



Map Showing Location of Plants and Transmission Lines.

ice interests and the physical inter-connection of their several plants, and the construction of new plants to become a part of the system. These consolidations were necessary to meet a demand for continuous service for mines, mills, smelters, railroads, manufacturing plants and municipalities. Security against interruptions of service was found in arrangements to draw on the current of the numerous plants of a big system, instead of relying upon the direct supply of an individual plant. While cities and towns have expanded, and manufacturing has increased, the great demands for power, which caused such rapid power development, came from the mining industry and the railroads. The Butte, Anaconda & Pacific railroad took the initiative in utilizing electric energy for freight and passenger trains. It completed the electrification of its 70 miles of road in 1913, and provided electric locomotives for this work. The economy and efficiency of its operations by electric power exceeded expectations, and its success probably was influential in the prompt action taken by the C. M. & St. Paul railway in electrifying 440 miles of its main line between Harlowton, Montana, and Avery, Idaho. The latter company has had electrically operated trains on that part of its system since December, 1916.

Mining Companies Adopt Electric Power.

The mining companies of Butte were slow to adopt electricity for power until such problems as continuity of service, long-distance transmission and adaptability were solved; gradually these were all practically demonstrated and the electrification of mines for operating air-compressors, pumps, haulage cars, and in many cases for hoisting, was rapidly accomplished. The Anaconda Mining Company led the way to a considerable extent by installing eight electric synchronous motors of 1,200-horsepower each to operate its air-compressors. At the same time, it converted its steam hoists into air hoists, and provided for compressed-air storage in cylindrical steel tanks, which were connected to a water-pressure reservoir, the latter situated upon an adjoining hill of sufficient height to maintain a working pressure. This made the capacities of the air-receivers available at about full pressure and resulted in storing air sufficient to operate the several hoists for thirty minutes after air-compressors ceased to operate. This acts as a reserve power whereby the men may be taken out of the mines in case of the failure of power from outside sources.

In 1914 about 365,145,736 kilowatt-hours of energy were delivered to consumers of power, and for 1916 this was increased about 50 per cent. It is estimated that 95 per cent of the energy sold is being utilized for mining, industrial and railway power purposes.

Missouri River Water Storage.

The eight hydroelectric plants situated on the Missouri and Madison rivers utilize 600-feet head, the same volume of water passing successively over the dam at each plant. Of the three streams which join at Three Forks to form the Missouri River, the Madi-

son is the largest. Near the headwaters of the Madison, an earthen dam, 600 feet long, 107 feet high, having a concrete-core wall, was thrown across the stream, whereby the Hebgen reservoir was created. This reservoir is now a lake of 13,000 acres with a shore-line of 65 miles, and having a storage capacity 325,000 acre-feet. It receives the drainage of an area of 900 square miles, where there is an annual precipitation of 30 inchs. This dam and reservoir renders the flood waters available during the natural period of low water; besides it adds 87 per cent to the volume of local storage available for the plants on the Madison and Missouri. The physical combination of the eight plants on one steam, where the same water is successively used, gives an opportunity to use stored water through each plant in series.

Data on Plants.

The Big Hole plant was constructed in 1898. This is situated on Big Hole River, 22 miles southwest of Butte, that stream being a tributary of the Jefferson. Here a rock-filled, timber-crib dam was built, developing 65-foot head. Steel penstocks were so placed as to carry the water to four Leffel wheels, each of which drives a 750-kilowatt generator. The current thus generated is transmitted at 15,000 volts to Butte over a cedar pole line. This was the first of the system, and the equipment is still doing good service.

Madison River Plant.

Madison River plant, in Madison canyon, consists of a rock and concrete-filled, timber-crib dam, from which two conduits, 10 feet and 12 feet diameter, respectively, extend down stream a distance of 7415 feet, discharging into a balancing basin; four steel penstocks, 9 feet diameter, carry water from this basin to four 3700-horsepower, double, horizontal Leffel turbines, each connected to a 2500-kilowatt generator. Current generated here is transmitted to Butte and other substations by two lines. The line originally built carrying 46,200 volts to Butte, is of No. 1 stranded aluminum wire, with Provo glass insulators mounted upon 21-inch locust pins. In order to deliver an increased load from this plant a steel tower line was built parallel to the first, in 1908. Conductors on this line consist of No. 0 stranded copper wire on suspended insulators, and carry 110,000 volts.

Canyon Ferry Plant.

The plant farthest upstream on the Missouri River proper is at Canyon Ferry, seventeen miles east of Helena, and was built in 1898. A rock-filled, timber-crib dam, 490 feet long, 40 feet high, built at this place, develops a 40-foot head, and stores 40,000 acre-feet. The power house contains ten 1000-horsepower double, horizontal turbines, each connected to a 750-kilowatt, 550-volt generator. The 550-volt switchboard is provided with air-brake circuit breakers and triplicate busbars to which connection is made by knife switches. Current is transmitted from here by four circuits of No. 4 solid copper wire to Helena, 17 miles distant, at 12,000 volts; and over two No. 0 stranded copper lines,

Vertical Generator Sets in Volta Plant, Great Falls.

at 70,000 volts, to Butte, 65 miles away. The 12,000-volt pole line is equipped with two-part, 4½-inch glazed porcelain insulators on 9-inch wooden pins. The 70,000-volt lines are provided with 9-inch glass insulators, on 18-inch treated wooden pins, protected by glass sleeves. The dam at this place creates a backwater reservoir 6 miles long and 1½ miles wide.

Hauser Lake Project.

Hauser Lake development is also on Missouri River, sixteen miles down stream from Canyon Ferry. A head of 65 feet is developed here by a dam of mass concrete, 720 feet in length, with a height of 130 feet from bedrock to the top of the bridge. The backwater extends upstream to Canyon Ferry, making a storage basin of 46,000 acre-feet. The dam has removable flashboards, by which water-level 14 feet above the spillway may be maintained. Water is conveyed from the forebay to six horizontal, 4000-horsepower turbines, each driving a 2800-kilowatt generator. After the completion of Hebgen dam the Hauser Lake plant was increased by the installation of another generating unit of 3750-kilowatts capacity. Power developed here is transmitted at 66,000 volts by duplicate lines to a junction with the Canyon Ferry transmission lines at East Helena, and there interconnected with the general distribution system. At the plant the low-tension buses are in duplicate; the high-tension side of the transformers is connected through selector knife switches to a ring bus system to which the two transmission lines are connected through oil circuit-breakers.

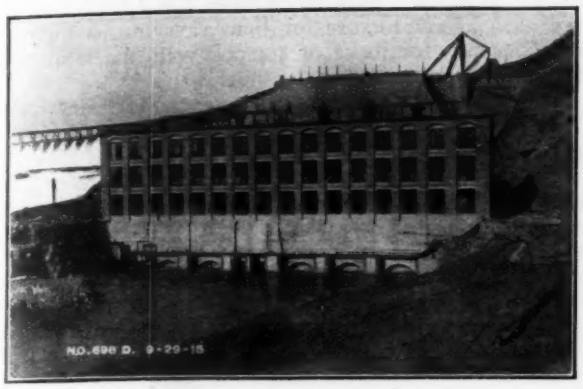
Black Eagle Station.

This is within the limits of the city of Great Falls, and was built in 1890, being the oldest in the company's system of plants. It has a capacity of 13,000 kilowatts, developed by 44-foot head of water. A rock-filled, timber-crib dam, with masonry abutments, was built at the crest of the falls. The original plant of 8000-horsepower was built at the north end of the dam, current from which was used by the Copper Ore Reduction Works; at the south end of the dam is a 3000-kilowatt plant for commercial service. It is stated that the old plant which serves the smelter will be replaced by a new one of 10,000 kilowatts capacity.

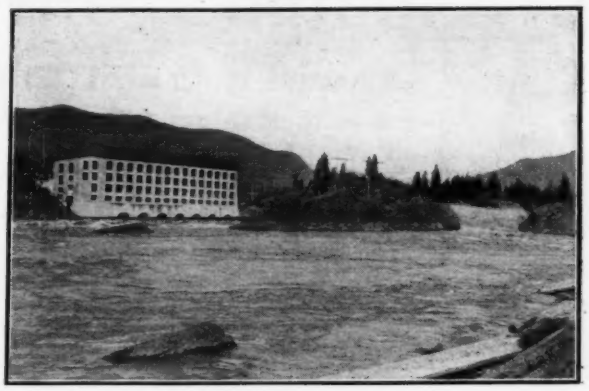
Rainbow Plant.

Rainbow generating station is situated at Coulter's, Rainbow and Crooked Falls, four miles below Black Eagle Falls. The plant was originally completed in 1910, and enlarged in 1916. A head of 107 feet was secured here by constructing an A-shaped rock and concrete-filled timber-crib dam on the crest of Rainbow Falls. The structure has 1140 feet of spillway, is 36 feet high, and is equipped with 10-foot removable flashboards. At each end are massive concrete abutments and sluice-gate structures. At one end is an intake forebay, from which two steel conduits, each 15½ feet diameter, 2400 feet long, conduct the water to a concrete balancing reservoir, having an area of 2½ acres; it passes from this reservoir through twelve steel pressure pipes, each 8 feet diameter and 300 feet long, to six 8000-horsepower double-runner Francis inward-flow water wheels, directly coupled to six 3500-kilowatt, 6600-volt General Electric generators. A tailrace, 1100 feet in length, excavated through solid rock, carries the water to the river below the falls. The head of 107 feet is produced by a 36-foot dam, 35-foot fall at Rainbow and a 25-foot drop at Coulter Falls, as well as the intervening rapids. Two parallel

Generator Floor, Rainbow Plant, Great Falls.



Power House at Volta—Upstream View.



Thompson Falls Power Station.

steel tower lines, carrying current at 100,000 volts, extend from Rainbow plant to Butte, a distance of 130 miles, and double-pole lines extend 72 miles west to the Sun River region, 106 miles north to Havre, and 125 miles east to Lewistown, all carrying current at 50,000 volts; also, 8000 kilowatts are transmitted to the Great Falls smelters over a 6600-volt feeder line four miles long. The lines to Havre, Lewistown and Sun River are the two-pole bridge type, with suspension insulators.

The Volta Station.

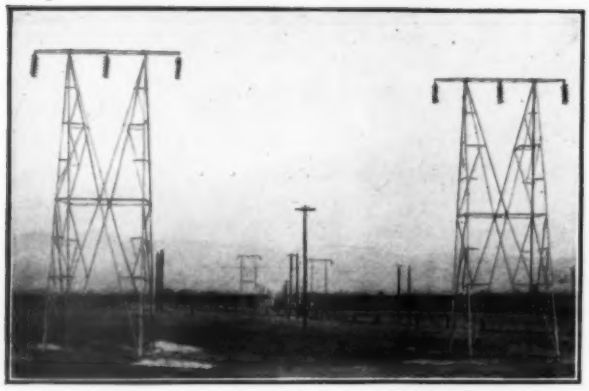
The crowning achievement of this company in central-station construction is seen at the Volta plant, situated at the Great Falls of the Missouri, about 12 miles below the city of Great Falls. A gravity concrete dam, 1250 feet in length, 72 feet in height, in the form of an arch of 563-foot radius, was constructed just above the brink of the falls; the arched form was adopted to secure the required length of spillway. The left end of the dam curves downstream, forming a forebay, through which six main penstocks, 282 feet in length, extend down to the water wheels; and two other penstocks take the same course to the exciter units. The main steel penstocks are each 12 feet 8 inches diameter at the headgates, and 8 feet diameter at the water wheels; the smaller penstocks are each 5 feet diameter at headgates and 18 inches at the wheels. The natural height of the falls is 78 feet, which, with the 72-foot height of dam, gives an operating head of 150 feet. The water wheels are the S. Morgan Smith type of vertical turbines, revolving in a horizontal plane, are 8 feet diameter, 1400-horsepower, having a speed of 200 revolutions per minute, within cast iron scroll casings. These turbines are equipped with Woodward oil-pressure governors, the motors operating in pairs, connected directly to the gate operating rings. The six generators are the General Electric vertical type, each being a 10,000-kilowatt, 6600-volt, 3-phase, 60-cycle machine. The transformers consist of twelve 6000-kilowatt-ampere single-phase units. The switching arrangement is in duplicate, there being duplicate exciter buses, and duplicate oil switches for each generator, transformer unit and each line, so that any combination can be obtained without the operator leaving the switchboard. This station can be operated as two entirely separate sections, each with its own speed and voltage control, two Tirrill regulators being provided. This arrangement of switching has been objected to, on account of complications and greater cost of installations, but the view of the operating engineer is that for a large station where maintenance of service is important and where the number of attendants are small, this arrangement greatly simplifies control and is worth the extra cost. Three transmission lines extend out from this plant, all being two-pole, bridge type lines, carrying 100,000 volts. One line runs 106 miles southeast to Two-Dot, as a feeder for the C. M. & St. Paul railway; another extends 142 miles southwest to Morel, near Anaconda, as a feeder for the same system; the third runs 10 miles up stream to the electrolytic zinc plant of the Anaconda Copper Company. The power house, a reinforced concrete structure, was specially designed to accommodate the most modern installations within. An accompanying illustration shows the six vertical generators, with oil-pressure governors for turbines, which is typical of the symmetrical arrangement throughout. The transformers are to the right of generators, each recessed in a separate apartment, the switchboards occupying the floor, above the transformers. This plant, as well as the plant at Thompson Falls, was built especially to meet the increased demand for power on account of the C. M. & St. Paul railway electrification.

Thompson Falls Development.

The plant on Clark's fork of the Columbia River, at Thompson Falls, being in the western part of the state, supplies power for that part of the Milwaukee railroad, and for a number of mines in Coeur d'Alene district, Idaho. For the latter service, the company delivers current at the Idaho state line, connecting there with transmission lines operated by several mining companies in joint arrangement. About 7500 kilowatts are supplied in that way. At Thompson Falls the river has a minimum flow of 6500 second feet, and has a natural fall of 20 feet. By constructing a concrete dam 1000 feet long, 35 feet high, above the falls, a head of 55 feet was developed. The power house is situated at a site 600 feet down stream from the dam, water being conducted thereto through a side channel and a canal excavated in solid rock. The equipment consists of six single-runner, vertical turbines, and the same number of 5000-kilowatt, 6600-volt generators. The plan of power house and switching arrangement are practically the same as those of Volta plant. Power is transmitted from the plant over 110,000-volt lines; two such lines serve the mining district referred to, and two others supply power to the C. M. & St. P. railway, the western terminus of its electrified line being at Avery, Idaho.

Holter Plant.

The plant at Holter, designed for a capacity of 40,000 kilowatts, is under construction and is to be completed by the end of 1917. The site is on the



Parallel Steel Tower Transmission Lines.

Missouri River, near Wolf Creek station, thirty miles north of Helena. The location is central as to the company's system. At this site a head of 100 feet is being developed by a concrete dam, 1350 feet long, 100 feet in height, there being no natural falls on the stream. Accompanying this is a picture, showing construction work well advanced. It shows the power house at one end of the dam, the two being closely connected in construction. The dam, of mass concrete, is composed of a 1-3-5 mix, and has base width of 180 feet. The plant equipment will consist of four single-runner turbines and four Westinghouse vertical generators of 10,000 kilowatts capacity each, with the same type of transformers and switchboards as at Volta. Current will be stepped up to 100,000 volts and turned into the general system through connection with the 100,000-volt lines which extend from Great Falls to Morel and Anaconda. The water storage produced by Holter dam will extend nearly to Hauser Lake, and will constitute the third in a chain of 50 miles, the three lakes having a storage of close to 150,000 acre-feet.

Notes on Transmission Lines.

High-voltage transmission has developed with the growth of this vast power system. The standard types of lines, as now adopted, are the two-pole, bridge type, spaced 12 to the mile, for 100,000-volt transmission; and the single-pole, double-arm line for 45,000 to 65,000-volt transmission. At the peaks of the two-pole bridge-type lines are strung two 3/8-inch Siemens-Martin steel ground wires, above the power circuits. The single-pole lines have one ground wire strand of three No. 10 iron wires at one end of the top cross-arm.

Suspension insulators are used on all lines higher than 45,000 volts. Strands of three No. 8 copper wires are used as conductors for lines carrying as high as 88,000 volts; for those of 102,000 volts the minimum size is No. 0 seven-strand copper.

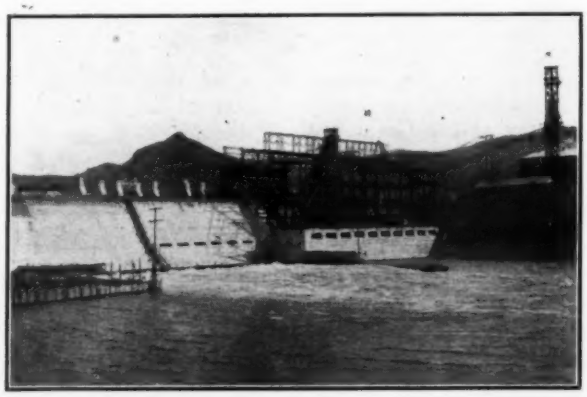
Pipe Line and Dam, Madison River Plant.

The double line of steel towers, 130 miles long, from Great Falls to Butte, are built of angle iron, each tower being 13 by 14 feet at base, the footings being six feet in the ground. Each tower has a 22-foot steel cross-arm, with three suspension insulators attached, carrying three No. 0 B. & G. 6-strand hard-drawn copper wires. These two parallel tower lines carry 100,000 volts. The average tower spacing is 672 feet, the longest span being 3034 feet. In these parallel lines a distance of 60 feet apart is maintained. The cost of each single tower line was close to $3200 per mile.

On the Volta-Morel two-pole line, 133 miles long, the average span is 440 feet. The poles of the two-pole bridge-type line are set 10½ feet apart, and each set has a cross-arm 22 feet in length, other dimensions being five by seven inches. The poles are usually purchased with butts creosoted, and are set 6½ feet in the ground.

Smaller Plants.

The company operates small hydroelectric plants at Billings, Livingston and Lewistown; and several steam-electric plants at Butte and elsewhere, maintained as sources of reserve power.



Holter Plant—Dam and Power House Under Construction.

Substations.

This power system utilizes 47 substations, having a combined capacity of 227,000 kilowatts. Three of these are at Butte, in fireproof buildings, their capacities being 13,275 kilowatts, 20,000 kilowatts and 28,800 kilowatts, respectively. Sixteen of the 47 substations are outdoors.

Lease of Underground Conduit System Approved, Pennsylvania.—Reversing a former decission, the Public Service Commission, Pennsylvania, has handed down an order approving the leasing of the conduit system of the Keystone Telephone Company, Philadelphia, by the Philadelphia Electric Company, at an annual rental of four cents a duct foot. The minimum rental will commence at $25,000 a year and increase $12,500 a year until a maximum of $100,000 is reached. The maximum rental for the use of the entire system is placed at $240,000. Upon the former application, the Commission refused to approve the proposed agreement on the ground that the rental price was too high and consumers would be forced to defray the amount.

The War and the Engineer

Inspiring Address on the Nation's Present Chief Business—War—and the Obligation on Engineers Particularly of Working Co-operatively to Bring It to a Successful Conclusion*

By E. W. RICE, Jr.,

President-Elect, American Institute of Electrical Engineers.

NO BODY of men can get together at the present time without soon discussing the subject of the war, which is uppermost in everyone's mind. The war is the one dominating factor in the world life and thrusts itself before our thoughts whether we wish it or not. We are in the war at last and will remain in it to the end. Whether it shall be a bitter end or a bright end will depend largely upon ourselves, as it is now our war.

It has been stated many times that modern war was largely a question of mechanics and engineering, a statement with which we must all agree. It is therefore self-evident that engineering must take a leading and dominant position in the war work. Now the electrical engineer stands for about the latest thing in engineering development; his activities embrace practically all other fields of engineering, being, so to speak, the last work in engineering. The electrical engineer must, therefore, realize that this is his war in a very personal and particular sense.

E. W. Rice, Jr.,
President-elect, American Institute of Electrical Engineers.

Primary Call Is for Work.

War calls for supreme sacrifices and the deepest devotion, but it also demands something more difficult to give, and that is *work*. War may be said to be the personification of work, not only individual work, but especially organized and disciplined work — disagreeable, dirty, heart-breaking, back-breaking, nerve-racking work, but always work. No nation of loafers ever won a war. Other things being at all equal, that nation or people who are willing to work the hardest will surely win the victory.

Now, I wish to point out that the enemy we are fighting is recognized as the most industrious organization in the world. Our enemy has prepared for war for fifty years and has been working with ever increasing energy ever since the war started three years ago. We made no adequate preparation during all this time and therefore started with a fearful handicap of lost time and lost opportunties. We must not delude ourselves that our enemy is exhausted, but remember that he has the advantage of a "flying start." We must accelerate at an incredible rate if we are to get our war-motor going fast enough, soon enough, to catch up.

Our enemy boasts that we have started too late. We must, by the hardest work, directed with scientific skill and accuracy, organize and effectively utilize all our power of work to make his prophecy an idle boast.

Criticisms, if Any, Must Be Constructive.

The country is trembling with eager anxiety to help. Men and women are offering their services and their money. All eyes are turned toward Washington and to many everything seems confusion, and as a result we are full of criticism. Now, I think it is clear gained by destructive and captious criticism. We that nothing is to be must discipline ourselves with patience, and, if we take a broad view, we must admit that progress is being made. We must remember that a democracy of a hundred million people, whose thoughts and habits have been entirely those of peace, cannot change to the methods of war in a day, or a month, or even a year.

War is a business and must be handled as a highly organized, centralized enterprise. We must, no matter how repugnant it may be to our habits and thoughts, temporarily adopt such methods of our enemy as are known to be efficient and successful, because the penalty of failure is death.

The things connected with war are so repugnant to our idea that it takes time to realize the necessity for and make the colossal changes demanded. We must, therefore, as I have stated, avoid captious criti-

*Delivered before the special New York meeting of the American Institute of Electrical Engineers, June 27, 1917.

cism and confine ourselves to constructive criticism, and that sparingly and sympathetically administered.

War Will Not Be Won by Miracles, but by Team Work.

There is one idea which we must abandon. The great majority of our people, having no acquaintance with science or engineering, are prone to imagine that this war will be settled quickly by some wonderful new invention, as if by an act of legerdemain; but you engineers realize that such a thing is practically impossible. It is so hopeless that it is cruel to permit any such idea to take hold of the American public. Neither is it possible for the war to be settled by the act of some hero or superman. It can only be settled by the united efforts of thousands of men, each contributing his bit. Team play in our civil army at home is as essential as in our fighting army abroad.

I venture to suggest that we cannot all occupy desks at Washington, and it is well for us, and for the country, that we cannot. We can, however, put ourselves and our business in such condition as to meet whatever demand is made upon us. Only relatively few can be useful in the direct service of the army and navy, but there is plenty of honorable work and useful work for us to do. The most effective work for most of us will be in the shops and offices at home, and everyone who does his work loyally and well is as much a factor in our organized war as the man at the front.

Now, properly understood, the fact that no single great invention is likely to be made which will win the war is no cause for discouragement. It does not mean that there will be no improvement, no new inventions, no new methods devised and put into effect. It simply means that we must not wait for the miracle which will never appear, but get to work and energetically take advantage of all present knowledge. We must survey the field, get at all the facts, carefully determine our plans and then proceed to put them into practical execution.

The Problem of Shipping.

Take, for example, the matter of shipping. This perhaps presents the greatest immediate problem of the war, frightfully complicated as it is by the submarine. I feel sure that it can be successfully solved, if we are content to solve it by the simple, common-sense methods used by engineers and successful business men in the ordinary course of business. The problem must first be carefully investigated, all available data quickly obtained and checked, and all new conditions considered, after which a broad-gauged, well-considered plan or plans can be formulated, criticised and then put into effect.

Of course, it is elementary to say that we must provide shipping in enormous quantities to replace that destroyed and to provide for increased demands. It is evident that time is the essence of the problem. We must, therefore, build the greatest tonnage in the shortest time. The ships must be manned and navigated to their destination and the most efficient methods provided for docking, unloading and loading.

With the situation such that the race is between ship building and ship destruction, with the destruction many laps ahead, it is vitally important that ships should be loaded and unloaded with the utmost expedition. We have recently heard of an instance where a large ship, after running the gauntlet of a voyage to England, was forced to visit several different ports, and waste one month's time, before starting the return voyage. This loss of time is equal to the loss of a complete voyage. The net tonnage delivered per month is the only thing that counts, therefore ship-tons saved is worth more than ship-tons built. Quick means of loading and unloading at specially devised terminals, here and in Europe, should be constructed and put into operation. The methods are known. It simply remains for us to organize and apply them.

We must see to it that the kind of ships, in respect to size, material and speeds, are such that the greatest tonnage may be moved across the seas in the shortest time. In the time element must of course be considered the time required to build such tonnage. If an investigation should indicate that cargo ships can be built which will successfully withstand one or more torpedo attacks, and which can also be provided with speed and armament sufficient to give them a good chance of fighting off and getting away from a submarine, they should be built, no matter whether such ships cost more, or are less adapted for use after the war, or take a little longer time to construct than those of the ordinary type.

It is entirely within the range of possibility that such ships may prove to be the only ones which will be able to navigate the seas with any decent chance of surviving. It would seem clear that, unless the submarine is swept from the seas, it is hopeless to build a large tonnage of slow-moving, relatively small and inadequately defended ships, as the net tonnage which could be delivered by such a fleet of ships will be too insignificant to be of any material value. We would have bet on the wrong horse and lost; therefore, I hope that we will have the foresight to build as large a number as possible of big, comparatively torpedoproof cargo ships as soon as possible.

We should also, at the same time, consider whether it is worth our while to continue building large dreadnaughts, battle-cruisers, and the like, which cannot possibly be finished for years to come. Our shipbuilding facilities are limited, and if the facilities now devoted to the construction of dreadnaughts could be immediately diverted to the construction of large, indestructible, high-speed cargo ships, which can be built in half the time, we will be taking a great step towards solving the problem.

Attacking the Submarine.

So much for what might be termed the "defensive method" of attacking the problem. Along with this defensive plan we should put into execution every practical offensive plan of attacking the submarine, such as methods of detection when submerged, methods of attack by means of destroyers, mines, aeroplanes and special artillery. All such methods should be, and probably are being, developed, and, while no one of them will prove to be the panacea by itself, collectively they will be of the greatest value in reducing the menace. However, I think it is well to emphasize the fact that the only safe and sane plan of action is to assume that we can only win by pushing the development of all practical looking methods of attack and defense, at the same time, and to the limit of our ability.

Now, I am well aware that there is nothing theatrical, or startling, or novel, in the above suggested solution. For this reason it is not likely to appeal to the great non-technical public, but there is no doubt in my own mind that it represents the scientific and common-sense method, and that if followed with patience, persistence, vigor and diligence it will prove

successful, and, if successful, the war cannot be lost. All the other problems of the war—the aeroplane, army, navy, food, manufacturing, farming, transportation, etc.—can be successfully solved by the same scientific but simple and common-sense methods.

Must Build Aeroplanes and Submarines.

It is a great satisfaction to notice that this country has at last awakened to the importance of developing that great American invention—the aeroplane—and of manufacturing on a great scale. We should do everything to help accelerate this work. If we can get aeroplanes of the right kind to Europe, soon enough and in sufficient quantities, experts tell us that it will do more to win the war than a large army.

We must also not neglect the development of the submarine, because if we fail to find a way to drive the submarine from the seas in short order, and fail to make relatively unsinkable and uncatchable ships, we may have to rely on big freight submarines, properly convoyed by fighting submarines, if necessary, in order to get food, material and soldiers to Europe.

Need for Collective Thought and Action.

We must not forget that, after all, all these things must be done by men collectively, and that, therefore, it is essential for us to think and act collectively, and with reasonable unanimity. We must co-operate, and not nullify our power by quarrels among ourselves. This means that we must be willing to give consideration to the views of others, be ready to make reasonable compromises and be constantly actuated by a spirit of co-operation. If, after a long and fair trial, we find that we have made a mistake in our selection, we should then promptly replace such leaders by those more competent, who will surely be found. This is the only way in which a democracy can work and form an effective and efficient organization.

I think I have said enough to indicate that there is plenty of work for engineers at home, as well as abroad; in civil life, as well as camp life. Engineers have a great opportunity in this way and a heavy responsibility. You have special knowledge, experience and a forward-looking point of view which the country needs, and it is your duty to see to it that you are given the opportunity to make effective use of your talents in the service of the Nation, and if you are not given that chance you must persistently demand it until you get it, and then I feel certain that the victory will be on our side, our civilization will be saved, and the world will be made a safe place for all decent people, and those who survive will be able to turn again to the satisfaction and joy of a useful and peaceful existence.

ELECTROMETALLURGICAL PLANT FOR SOUTH.

Ferro-Alloy Works Being Erected at Chattanooga.

By reason of hydroelectric power available from nearby plants, it has been possible for Chattanooga, Tenn., to add another industry to her already long list and one that is not only new in that city, but is the first of the kind in the South. Ferro-allovs for the manufacture of steel will be produced by the Southern Ferro-Alloy Company, capitalized at $210,000, and incorporated under the laws of Tennessee.

Preliminary work on the plant has begun. As the company was fortunate enough to secure the old plant of the Southern Steel Works in Chattanooga, actual manufacture is expected to begin in October. Remodeling of the building and installation of machinery, a large amount of which has been ordered, will consume the intervening months.

While formation of this company was doubtless inspired at this time by peculiar condition of the alloys market, there being an increased demand for this product with some of the foreign sources either cut off or handicapped in delivery, the Chattanooga plant was projected before the European war and will be a permanent one.

The location is a peculiarly good one, as all of the important raw materials exist in large quantities in the vicinity. Government reports which have been familiar to iron and steel producers for years show that there is practically inexhaustible supply of iron ore in the Chattanooga district. Chattanooga, too, is the manufacturing center for an area in which there are developed several notable water powers and enormous undeveloped water power. Silica abounds in the vicinity, some of which reaching Chattanooga on a low freight rate analyzes as high as 99.2 per cent.

The power contract placed by the Southern Ferro-Alloy Company with the Tennessee Power Company was the largest single order for current ever given by a firm in Chattanooga, calling for 3000 horsepower.

First among the products to be manufactured will be what is technically known as ferro-silicon, 50 per cent or higher, which is an alloy of iron and silicon extensively used in the manufacture of steel. This product will be made in three huge electric furnaces, running day and night, seven days a week. It is planned by the organizers of the company to expand the line of products manufactured, after operations are well under way, to include ferro-tungsten, ferro-molybdenum and ferro-chromium, all of which alloys are likewise extensively used in the manufacture of high-grade steels.

All electrical equipment contracts have been placed. It is announced by the company that the plant will be a model one in its comforts and conveniences for laborers, including shower baths, etc., and will be equipped with every known mechanical and electrical device for the economical handling of materials and finished products. The plant was designed by the Fitz-Gerald Laboratories, Niagara Falls, N. Y.

Water-Power Plant to Be Rebuilt.

The hydroelectric power plant at the "Big Dam" at Klapperthal, Pa., along the river below Reading, which was destroyed by fire about four years ago, is to be rebuilt by the Metropolitan Electric Company at a cost of about $100,000 and is expected to be ready for operation next fall. The high cost of fuel makes it essential that all water power be conserved and the great need for economy along all lines has turned attention to the rebuilding of this Klapperthal plant.

The Metropolitan Electric Company already has started construction work for the enlargement of water powers. This involves the installation of two generators driven by water wheels, which, with the necessary auxiliary machinery, will make the plant a complete hydroelectric generating station of the most modern type. It will be connected with the West Reading power plant of the company by a transmission line, and the water now going to waste over the Klapperthal dam will be fully utilized. This is the equivalent of over six million kilowatt-hours per year, or eight million horsepower-hours. This will mean a saving of about 10,000 tons of coal per annum.

ELECTRIC RANGE
RECIPE No. 4 NUT BREAD
Flour, 2 cups or 1 cup of white and one cup of graham
Baking Powder - 3 tsp.
Sugar - - - ½ cup
Salt - - - - ½ tsp.
Egg - - - - 1
Milk (sweet) - - 1 cup
Nut Meats - - ½ cup
METHOD
To the dry ingredients add beaten egg. Add the milk alternately with the flour, then add the floured nuts. Fill oiled tins half full and let raise twenty minutes. Bake fifty minutes in a moderate oven.
TEAR OFF AND PASTE IN YOUR RECIPE BOOK
ELECTRIC COOKING BUREAU
THE MINNEAPOLIS GENERAL ELECTRIC CO.
MAIN 6100

One of a Series of Electric-Cooking Recipe Cards.

Advertising Electric-Cooking Service

A Greater Need Now for Educational Work and Advertising Than at Any Other Time—Minneapolis Company's Activities Bringing Good Results

By T. H. KETTLE

Minneapolis General Electric Company.

THE other day three men were discussing the high cost of electric ranges and its effect on present and future sales. One gentleman was a jobber, the other a dealer, the third party being the writer.

As is usual in the discussion of any selling problem, the subject of advertising came up and after a very interesting discussion, it was suggested by the dealer that the writer draft a little article along the lines of the conference, the idea being that it was quite possible that men in other parts of the country interested in electric cooking might be glad to get the opinions of other men and what they are actually doing to overcome the war scare and war prices.

First of all, let us look at the price situation. Everybody knows that everything used in the manufacture of electric ranges is trying to hit the sky and that labor is demanding more and more money, is getting it, and the result is—electric ranges have advanced in price to such an extent that it is practically impossible to sell a range except in the case where the prospect has absolutely no other choice. In short then, what interests the electric cooking man, is to know where we are going to land and what to do in the meantime.

The manufacturer of electric ranges seems to always have the privilege of increasing the price whenever he sees fit, but the man who sells the electric cooking idea has to go back to his old prospects and endeavor to sell them the same service exactly and quote a higher price, knowing full well all the time that he is unable to give the prospect one thing more than we could when the prices were 30 per cent lower a year ago. This is practically impossible at the present time for the country has just been combed by the Liberty loan, the Red Cross and many other charitable and worthy endeavors. So then, when considering what can be done in order to overcome the effects brought about by the high cost of electric ranges, most central-station men want to investigate and see why and how this unusual condition has arisen.

First Cost of Electric Range.

It is absolutely useless to waste time investigating something over which we have no control. High prices are with us, will stay, and it is up to us to overcome the effect they might produce on the public mind by using every atom of originality, initiative and sales strategy we can. Personally I believe the war is a wonderful opportunity for the display of sales and educational schemes, which will be used now that the present situation is with us.

Therefore, without wasting any more time investigating why the prices of ranges are where they are, who put them there and how long present prices will be maintained, let us look at the subject in a broad-minded, farsighted way, remembering all the time that what we have accomplished to date in the electric-cooking field is practically nothing compared with a few years hence.

Of course it is not the height of business wisdom to ignore the price situation entirely. I believe, however, that our time can be employed much more profitably in a study of the laws of nature and find the connection between them and the fundamentals of selling electric ranges. This we shall go into later.

In our discussion of the electric range situation, the dealer said that in view of the high cost of ranges,

we should abandon the sale of ranges until such time as the price might return to a normal basis. He stated that it was quite difficult to sell electric cooking before the price advance and now that the rise in prices was getting to be a regular affair, the only natural thing to do was to concentrate our efforts on the sale of such devices as could be sold in sufficient volume to justify the efforts expended. To my mind he was decidedly on the wrong track. The suggestion of the jobber was to trim every possible expense, advertising and selling, use one color where two and three had been used before, and perhaps do a little advertising in the newspapers so that at least those who had been thinking of electric cooking might not forget it altogether.

The writer suggested the idea that perhaps the only solution to the sale of ranges consisted in increasing the advertising expenditure, both direct by mail work as well as general newspaper publicity, on electric cooking. I realize that this idea may seem a little out of place during these times of economy talk, but nevertheless I believe it the key to the whole situation, if the electric cooking man really wants to work up a desire for his services.

To my mind there are two kinds of people when it comes to selling electric cooking. The first class consists of those who have become interested, either through friends or advertising they might have seen. The second class, and these are the ones who will ultimately pay the profit on the electric-cooking idea, consists of those who have not yet become interested in the subject even to the point of inquiry; or to the point of even giving the subject a moment's thought. We all must know that hundreds of thousands of people are practically ignorant of what electric cooking is. Mention the electric range at some gathering and see how much enthusiasm you can stir up. Very little, I venture to say, unless of course you happen to strike an unusual community, which has been intensively worked by some good electric-range man.

Free Recipe Service To Our Customers

Miss Bernice Bell

Miss Bernice Bell is the Domestic Science Expert of our Electric Cooking Bureau.

She offers you five years of practical experience in the solution of cooking problems, reducing household costs and improving cooking methods by the employment of electricity.

Just at this time Miss Bell's specialty is the making of recipes that will really and truly solve the High Cost of Living

Miss Bell is willing at any time to help you, so be sure to come and see her, or 'phone Main 6100 or T. S. 32321 and arrange to receive her free recipe service.

If you want a recipe or an idea for any special occasion, do not hesitate to come in and see her. Better make a note of her telephone number NOW.

The Minneapolis General Electric Co.
15 South Fifth Street

Advertisement Announcing Free Recipe Service by Domestic Science Expert.

A SPECIALIZED BUREAU OF COOKING EXPERTS READY TO HELP YOU

OUR Electric Cooking Bureau was established in the early part of 1916 for the special purpose of benefiting the housewives of Minneapolis by offering authoritative advice on cooking.

In the first year of its existence it has collected a large number of recipes and a vast amount of valuable information pertaining to cooking in general.

Miss Bernice Bell, who is our Domestic Science Expert, has helped develop the Bureau to a high state of efficiency and usefulness.

As a matter of fact, she is, literally, a "doctor of cooking", for her experience has brought her into contact with almost every conceivable problem in cooking.

It is quite possible that Miss Bell will be able to make suggestions and give you just the recipe you you have been looking for.

Call and see her any time. But be sure to mail the attached post card so that you will receive her favorite recipes from time to time.

THE MINNEAPOLIS GENERAL ELECTRIC CO.
220 Loeb Arcade

Inner Page of Cooking Bureau's Special Folder.

The Minneapolis General Electric Co.
15 South Fifth Street

The Electric Cooking Bureau:

Kindly place my name on your mailing list to receive favorite recipes.

Name_____

Address_____

RETURN THIS CARD

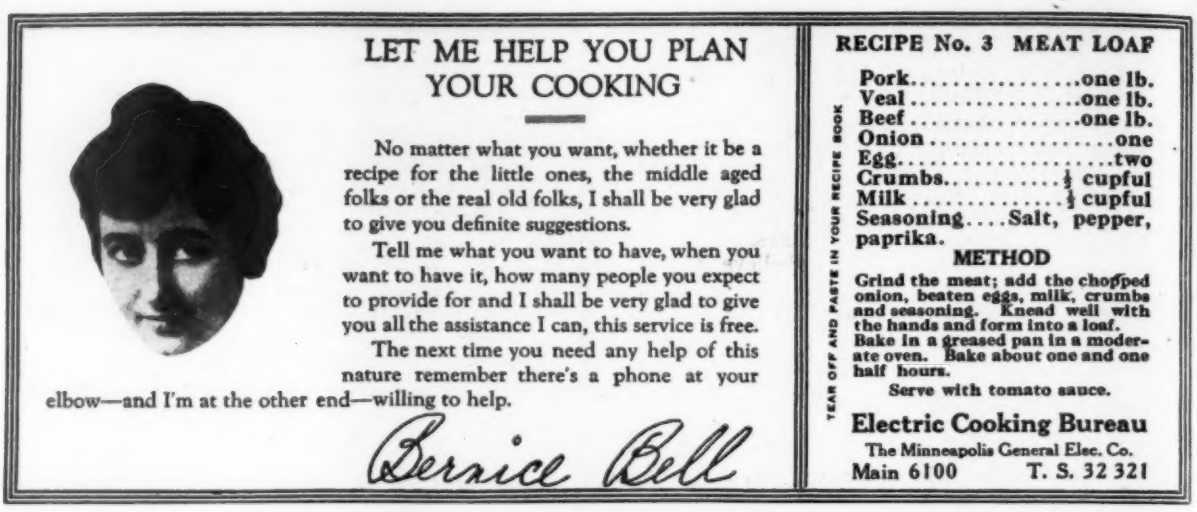
Mail this Card today—Now, while you think of it! Thank you!

Convenient Reply Card Attached to Folder.

More Educational Work Needed.

It seems to the writer that the only way to sell the electric cooking idea is to invest more money than ever in educating the people and this should be done in the form of two kinds of publicity—direct-by-mail advertising for the first class and a constant propaganda of education for those of the second.

Considering the first class, i. e., those who have become interested in the subject to the point of inquiry, the seed has been sown and all we need to do is to cultivate it, just as you would nurse and cultivate a crop of any kind, be it flowers, seeds, or anything else that requires attention. Advertising follows natural laws, just as the growth of flowers is subject to natural laws. If you sow the seed in the right soil


LET ME HELP YOU PLAN YOUR COOKING
No matter what you want, whether it be a recipe for the little ones, the middle aged folks or the real old folks, I shall be very glad to give you definite suggestions.
Tell me what you want to have, when you want to have it, how many people you expect to provide for and I shall be very glad to give you all the assistance I can, this service is free.
The next time you need any help of this nature remember there's a phone at your elbow—and I'm at the other end—willing to help.
Bernice Bell
RECIPE No. 3 MEAT LOAF
Pork.....one lb.
Veal.....one lb.
Beef.....one lb.
Onion.....one
Egg.....two
Crumbs.....½ cupful
Milk.....½ cupful
Seasoning....Salt, pepper, paprika.
METHOD
Grind the meat; add the chopped onion, beaten eggs, milk, crumbs and seasoning. Knead well with the hands and form into a loaf. Bake in a greased pan in a moderate oven. Bake about one and one half hours.
Serve with tomato sauce.
TEAR OFF AND PASTE IN YOUR RECIPE BOOK
Electric Cooking Bureau
The Minneapolis General Elec. Co.
Main 6100 T. S. 32 321

Another Recipe Card, with Special Personal Touch Making a Strong Appeal to the Housewife.

and give it the right kind of attention, you know that you will obtain certain results. This is a natural law in business as well as in other lines of endeavor.

Then, why not cultivate the seeds of electric cooking that have been sown in the minds of the prospects who have inquired but not bought? If you consider the mind of every person who visits your electric-cooking display as soil where the seed has been sown and is only waiting to be cultivated and cared for, I believe that we have hit upon a plan that is scientifically conceived, planned and executed, the execution of the plan, of course, being just as important as the plan itself.

Electric-Cooking Publicity in Minneapolis.

In Minneapolis we endeavor to cultivate the prospects' minds by what we call our free recipe service.

This service consists of a weekly recipe card as shown in one of the illustrations, the drawing being done in three or four colors, the whole card being dressed up as attractively as possible in order to catch the eye, and through the eye, the mind.

These cards are mailed weekly to a selected list of 2,000 prospects. Every one of these prospects has had the electric cooking seed sown in their minds because every one of these has either visited the company's Cooking Bureau or has been interested by a representative. Therefore, you might call this list really a "selected" one, because they are a selected list and they receive a selective mailing every week.

The announcement of this special recipe service is shown in the illustration, the returns reaching the gratifying total of 40 per cent.

At the present time we have in Minneapolis 400 ranges in use and the users of these 400 ranges we believe are of wonderful value in helping us sell the electric cooking idea to their neighbors and friends. Accordingly, these 400 users also receive the free recipe cards every week and the actual calls from users more than justifies us in believing that this kind of service is appreciated and produces favorable comment and actual results.

As a matter of fact it is impossible to have a customer in a favorable frame of mind without receiving some benefit from it. Speaking generally, this whole idea as far as present users are concerned is nothing but the enlisting of the active and energetic co-operation of customers for the direct benefit of the customers themselves. In other words, the central station is merely investing money in the minds of users, in the form of favorable impressions, which ultimately are sure to be used on some unsuspecting prospects.

Of course it may take time before substantial effects will be felt, but this money, invested in the right kind of impressions is bound to make itself felt. This is a fundamental law and is entirely psychological.

A word about the recipes themselves. It is very necessary that this work be under the supervision of a domestic-science expert who thoroughly understands her business and can talk diatetics in a very convincing way. This is absolutely essential to the successful working of this kind of service, because in dealing with the food question we are dealing with a great force which can be constructive or destructive. Too much attention cannot be paid to the selection of your cooking expert, and let me add the advertising man must work very closely indeed with this expert if his copy is to pull as it should.

I don't know of any other vehicle for carrying reason to the brain of your prospect and friendliness to the hearts of your customers than a free recipe service that doesn't make a direct grab for their pocketbook.

Activities Today Will Pay Dividends Later.

As I view this whole subject of selling electric ranges to a selected list it simmers right down to a natural law, which if obeyed, must produce results if carefully planned and executed, simply because during the process of cultivation you are, unconsciously perhaps, eliminating from your prospects' minds the thought of any competitive service; and this is especially true during these times of retrenchment on the part of many advertisers.

The point I want to leave with you here is, any money that you invest in the right kind of electric-cooking publicity during these times of high prices must come back to you with interest when prices become normal again or when the public becomes educated to present standards. Give this subject some deep thought. It will pay you big dividends in the not far distant future.

Coming now to the larger field of promise (I refer now to those people who have not yet evinced any interest in electric cooking). It is quite clear that nothing short of an intensive, continuous educational propaganda is what is necessary. As far as electric

cooking is concerned, the mass of people of any city can be likened to the younger generation attending the schools. What do you suppose would become of our future generation if our schools lacked a definite, preconceived and thoroughly thought out plan for the education of our future citizens? What do you suppose would become of our children's minds were they allowed to run wild and be allowed to think of anything but their studies? It is quite clear on the face of it. Their minds would become occupied by things and states entirely foreign to their studies.

Exactly the same thing happens, I believe, in the minds of your electric-range prospects. Unless you keep, by means of general educational publicity of the constant variety, the thought of electric cooking uppermost in their minds, their minds are going to be planted by suggestion from other sources and the influence of those suggestions will entirely destroy the effect of your advertising unless it is of the constant attractive and educational kind.

Taking a broad view of this subject of cooking by electricity, it seems that nothing short of a constant educational publicity campaign will turn the trick. For, after all, men are nothing more than boys grown up and must be educated before they can be convinced that anything new is good for them.

And now is the time to start that educational influence to work. For this reason: The United States Government has recently appropriated $7,000,000,000 in addition to the regular expenses of the government, and this money is going to be spent right here in this country—every cent of it. In other words, there is going to be more money, which history and experience teaches us, means more spending. Just think what an educational campaign means in a country where the people are going to have more money than they ever had before, and all the factories humming night and day. It simply means that these folks with more money are going to spend more money and the man or industry who is wise enough to educate these people at a time when they will be accumulating more than they ever thought they would have, will unquestionably reap a rich harvest when the cumulative effect of his advertising begins to ripen, as it must.

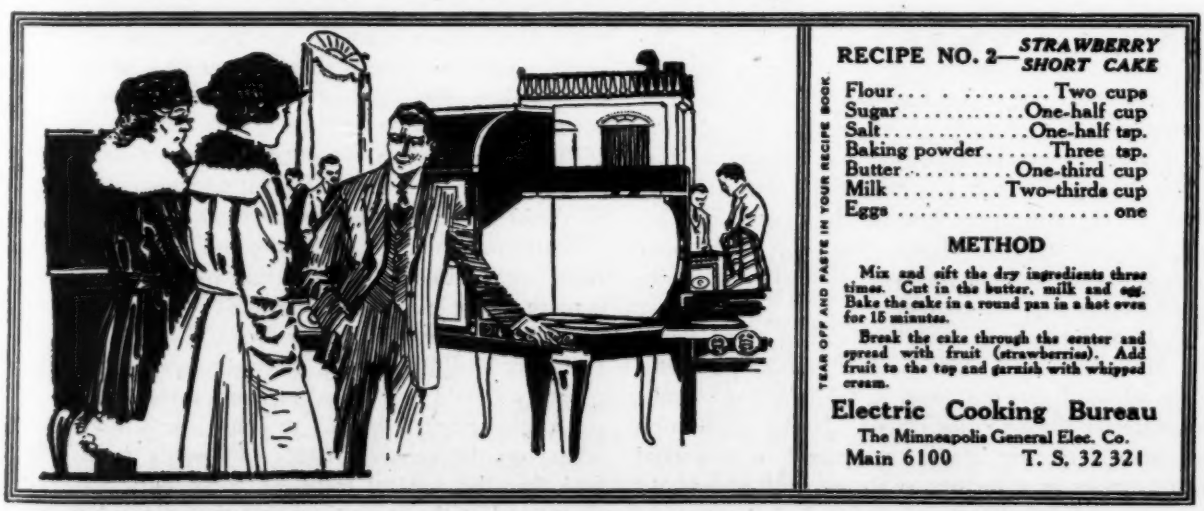
Never in the history of electric cooking did the central station have such an opportunity to invest money in such a profitable investment. Think also of the time when the first million men have been drafted. Wages and salaries will shoot upwards, the standard of living will gradually rise, and now is the time to keep before the eyes of the people the subject of electric cooking so that when these conditions have arrived, they will have absorbed, unconsciously perhaps, but nevertheless surely, the fundamentals of the new science of electric cooking. We, in the central-station game, have a remarkable opportunity—a product that has actually proved its superiority by a convincing demonstration and a market that will be simply wading—swimming—high diving—in Gold!

Don't worry about what all this educational advertising is going to cost. The thing for the central-station man to worry about is what it will cost us if we neglect the opportunity!

Look into this thing as you have never looked into anything before so that we can all be prepared for the tremendous sales we are entitled to make by reason of the health-producing service we can render to the women of the country.

In closing I want to make just one point, and that is that all this advertising for future results is entirely psychological and must be handled with extreme care so that every impression you try to convey to your prospect will create just a little more favorable brain excitement—the whole series of impressions resulting in a brain discharge in favor of your proposition—as the psychologist would say. In other words, every thought, word and deed in your advertising must literally breathe electric cooking, and breathe it in such a way that the educational and editorial instinct is highly developed. Strange as it may seem, the biggest successes in any sales campaign have been those who refuse to make a grab for the prospect's purse.

Selling Electric Service.—"Selling Electric Service" was the subject of an address by Harry W. Alexander, director of publicity of the Society for Electrical Development, at the annual convention of the Electrical Contractors' Association of the State of Pennsylvania, held at the Hotel Adelphia, Philadelphia, June 19. The Society is striking a new note in regard to selling merchandising, appliances, motors, etc. It grew with their booklet, "How to Sell an Idea," for electric range salesmen. The same thought has been carried into their latest booklet, "Buying a Cause and Paying for Effect." The Society is driving the message home hard through publicity to the industry and addresses before electrical associations, that it is the idea of what electricity will do—not the medium through which it is used—that electric salesmen are selling.



TEAR OFF AND PASTE IN YOUR RECIPE BOOK

RECIPE NO. 2—*STRAWBERRY SHORT CAKE*

Flour	Two cups
Sugar	One-half cup
Salt	One-half tsp.
Baking powder	Three tsp.
Butter	One-third cup
Milk	Two-thirds cup
Eggs	one

METHOD

Mix and sift the dry ingredients three times. Cut in the butter, milk and egg. Bake the cake in a round pan in a hot oven for 15 minutes.

Break the cake through the center and spread with fruit (strawberries). Add fruit to the top and garnish with whipped cream.

Electric Cooking Bureau

The Minneapolis General Elec. Co.

Main 6100 T. S. 32 321

Still Another Recipe Card with Implied Invitation to Visit the Demonstration and Sales Room.

Editorial Comment

Help Win the War by Efficient Service

"WHAT can I do to help my country and its allies to win the war?" is a question which is today before thousands of public utility employees who for one reason or another cannot enlist in the army or navy. Practically everybody wants to help; most of us realize that we can help in ways that seem small in themselves. How to render a real service, how to do one's utmost for the cause of liberty within one's own limited field, that is the real question.

Electrical people can help, not only through personal contributions to the military forces of the country and to the great organizations for the relief of suffering of which the Red Cross is the conspicuous leader, but by working harder than ever to increase human efficiency by better lighting, improvements in motor drives, increased production in shop, office and field. Every meter reader who quickens his work so that a little more time is left for other duties in small companies, every employee who exerts himself or herself a little more, so that someone else's work can be lightened, helps and helps greatly. A distinguished bishop of the Episcopal Church said recently that by working a little harder everyone denied the opportunity to serve in blue or in khaki can do his part, and without getting hysterical. Increased personal and community efficiency must be sought on every hand; not blind and timid retrenchment of activity, but a consistent and steady development of power to do the next thing better.

Let no one belittle his or her work because it is not spectacular. It is entirely possible for the girl who knits a single sweater for the Red Cross to be an immediate factor in the victory of the Allies, of which we are at last one in hand as well as in heart. The gun pointer who wears that sweater may be kept from numbness due to cold at the critical moment in an attack on a submarine or in clearing the advance of the infantry by the barrage fire. Gigantic as this terrible war is, it is a war of infinite detail; every dollar, every man, every surgical dressing, every improved motor drive in the munition shop, every hour saved in production and transportation of food, clothing, and other supplies counts.

Is it of no consequence to install a small floodlight in an industrial plant yard or passageway hitherto a cause of slowing down in the handling of men and material through the place? Is the application of industrial electric heating equipment or industrial electric trucks in a factory swamped with orders for army shoes of no military importance? Let every one of us do the next thing with might and main, thinking hard how we can help in the cause, but never making the mistake of belittling our efforts, humble though they may be. Pulling weeds out of the substation vegetable garden is a step in fighting Germany as well as cheerfully working overtime in the shipyards where destroyers are being constructed. Off with our coats, on with our aprons, and let us stick to it with untiring zeal, men and women of the electrical field, for never in the history of the world was there so great an opportunity for winning such a prize by co-operation on behalf of Liberty!

Caution Against Hasty Rate Increases

EXTRAORDINARY high prices now prevailing for coal, copper, steel and other materials used by central-station companies have induced a considerable number of them to seek permission to increase the rates for electric service. This is particularly true in the case of those utilities whose rates have been on such a basis as leaves but a scant margin for reasonable profit to the investors. In several cases power rates have already been advanced and in fewer instances lighting rates also.

War time is almost invariably a time of enhanced prices and depreciated purchasing power of money. General recognition of this fact, combined with the exceptional prosperity of the past year or so, accounts for the relative apathy of the public toward the present increased level of prices. It also accounts for the almost universal readiness to pay high prices where it is evident that these are not artificially inflated. No one can expect a seller to dispose of his wares at less than cost, nor to maintain the same schedule of prices when the costs have gone up very materially. The public is therefore ready to pay higher rates for electricity when it is shown that maintenance of the former rates would entail positive loss or even serious curtailment of utility profits.

This philosophical view of the case has already been taken by some utility regulating commissions and no doubt will be taken by nearly all others to whom a clearly presented and substantiated statement of the facts is submitted. To prove that costs have gone up is quite a simple matter and to prove that net incomes have gone down is in many cases almost as simple. It is very likely, therefore, that rate increases will and properly should be granted in many instances.

At this point it is well to pause for a moment to reflect on the general history of electric rates. We find that the general trend of these rates has been downward at the same time that the value of electric

service has been steadily increased, due to the perfection of electrical appliances. A kilowatt-hour of electrical energy provides very much more light now than ten years ago because of the improved efficiencies of electric lamps and similarly a kilowatt-hour furnishes more actual power because of the higher efficiencies of motors. Consequently we have in steadily lowered rates and steadily increased efficiency of utilization a most powerful dual reason for the extraordinary increase in the use of electricity which has characterized this as the electrical age.

Central-station companies have been quick to make good use of this emphatic argument for the extension of electric service. Many of them have in their publicity work made frequent use of curves showing the steadily decreasing cost of electric service which has been coincident with increasing costs of food, rent, clothing and other necessities. Such graphic demonstration of the economy of electricity has had telling effect in winning over the quite large element that "must be shown" in dollars and cents. Shall this unbroken record of improved economy be interruptel by a sudden setback?

We earnestly hope it will not be necessary. If continuance of prevailing conditions indicates too close approach to the danger line of no profit, we urge utilities to seek authority for increasing their rates so as to be prepared against what would be inevitable loss. However, where approach to the danger point is remote, it is by far better to hold on tight without seeking this relief. Even where such relief seems imperative and is actually granted, it is well to hold it off as long as possible before putting it into effect. There are already evidences of improvement in the coal situation, both as to price and supply; this has been the most critical element that has brought the entire matter of increased electric rates up for consideration at this time.

At any rate, let us proceed with caution before spoiling one of the most convincing arguments that electricity has secured through the developments of countless inventors. War times are always abnormal and this is the most abnormal war ever fought. War conditions are themselves bringing about an exceptional increase in the uses of electricity. Let us make these increased uses permanent and, if it is at all possible, let us keep the price of electric service from going up in spite of all higher costs. At the close of the war what more splendid record could the electrical industry point to with justifiable pride than that it had rendered greatly increased service and, despite very serious difficulties, at no higher cost?

Central-Station "Cold Feet"

IN VIEW of the high cost of coal, copper and labor, there is a tendency among some central-station men at present to curtail their advertising and cut down their sales forces. This tendency is not general, we are glad to say, and we hope it will not become so. Now is the time, of course, to develop the off-peak load as never before; to cultivate to the utmost the service capacity of existing station and line equipment. It is entirely proper to scan critically the prospective profits of a power contract in the suburbs, which, at a rate of one cent per kilowatt-hour, would require the building of a $20,000 line extension to reach the load center. But it is also no time for "cold feet" in respect to new-business development.

Probably there never was a better time for the power solicitor to analyze his customers' conditions than now; to study to see how he can serve them most efficiently and how they also can economize in their production methods. More business and better business should be the motto. It is reasonably certain that the off-peak load possibilities are far from exhausted in most communities. Let us not forget that the better the load-factor, the better the fuel rate per kilowatt-hour. Additional output of the right kind costs mighty little with the modern high-powered turbo unit. Surely there is a field for excellent central-station publicity in popularizing some of these points through the aid of the solicitor and the advertising page.

If "Business As Usual" is a poor motto for these momentous times, "Business Must Go On" is indeed a first-class slogan. Therefore, let us all urge and energetically practice discrimination and avoid the "cold feet" which are the reactions of over-enthusiasm.

Broad-Gauged Summary of War Problem

EVERY patriotic citizen of this country has in the last few months given much thought to what the war meant to us and what we should do for an early but sucessful and permanent end. Not being a warlike nation, our preparations for active participation in the war have been woefully deficient and the problem now before us is not only gigantic but, to us, entirely new. Consequently an exceedingly large number of solutions have been suggested, some good, some bad, for facilitating our war activities.

Out of this maze of ideas it is pleasing to read a really broad-gauged summary of the situation prepared by an engineer and executive of ripened experience and breadth of view. We refer to the splendid address made by President-elect Rice of the American Institute of Electrical Engineers at the recent special New York meeting of this organization. He has analyzed the problem confronting us and presented an earnest plea for attacking it with sane, non-spectacular, co-ordinated and persistent methods. For the benefit of our readers we publish the address in this issue substantially in full.

Especially valuable features of Mr. Rice's address are his masterly survey of the shipping problem and his fine plea for co-operative action which should be given immediate consideration by not only engineers but all citizens.

HAPPENINGS IN THE INDUSTRY

American Electrochemists Will Hold Convention—Chicago Electrical Men to Have Big Outing—War-Time Electrical Developments in England—Puget Sound Utility War Measures

AMERICAN ELECTROCHEMICAL SOCIETY TO HOLD CONVENTION.

Issues Statement Showing Greater Need for Discussion in Present Crisis.

A number of scientific societies have deemed it advisable "on account of the war" to either cancel or postpone their future meetings and conventions. The American Electrochemical Society disapproves of this action, and at its recent board meeting adopted resolutions encouraging rather than discouraging the holding of meetings. A statement issued by the society is as follows:

"Modern warfare is not so much a matter of prowess at arms as it is a stupendous engineering undertaking. To hasten this war to an early and victorious close our many thousand engineers must bring to bear every possible effort. However, individual, independent effort is not desirable at this time; concertive action is absolutely essential for the most efficient service.

"In order to expedite the solution of many of the new problems that have arisen as a direct consequence of our martial state, unrestricted discussion of the problems (with but few exceptions) at scientific meetings is bound to give all a clearer understanding of the real points at issue of the urgent needs of our country at this momentous hour.

"Meetings of scientific and technical societies have ever served as a great stimulus for their members and have been a 'clearing house' for many of the best thoughts and ideas of our professional men.

"Let us follow the good example set us by England. Let us encourage rather than discourage the holding of scientific meetings in these war times. When England found herself confronted with a very serious shortage of sulphuric acid, glass, dyes, electrodes, brass, furnaces, etc., the scientific societies arranged symposiums on these subjects and invited not only all of the members to attend but further, urged those factory men who were not members to come to the meetings to give their views and experiences and to learn all they could in return.

"Just as a large business corporation depends upon the organized effort and efficiency of the several units and departments, so does our government, now more than ever, look to the organized concertive effort of its large engineering bodies for quick and efficient results. Let us continue holding our meetings and hold them more frequently than ever before."

The thirty-second general meeting of the American Electrochemical Society will be held in Pittsburgh, Pa., October 3 to 5. A special feature of the meeting will be a series of papers and discussions on electrochemical war supplies, and the important part the electrochemical industry will play in the present struggle.

The committee in charge is outlining an elaborate plan of technical sessions, visits to industrial plants and entertainment features. It invites the delegates to arrive in Pittsburgh on Tuesday, October 2, so as to get together informally and enjoy some recreations which have been planned for them.

On October 3 will be held a regular meeting of the Society in the morning, with optional excursions to industrial plants in the afternoon. In the evening an illustrated lecture on a semi-technical subject will be given.

On October 4, a symposium on electrochemical war supplies will be held in the morning, followed by excursions to industrial plants in the afternoon. A subscription dinner will be held at the William Penn Hotel in the evening, with special entertainment features. The ladies are especially invited to be present at this function.

Friday, October 5, will be devoted to an all-day excursion on a special train with complimentary luncheon, to several industrial plants in the Pittsburgh district.

ANNUAL OUTING OF ELECTRIC CLUB—JOVIAN LEAGUE OF CHICAGO.

Excursion to the Famous Dunes at South End of Lake Michigan, on July 19.

The Electric Club—Jovian League of Chicago will hold its annual outing and picnic at Miller, Ind., 35 miles south of the center of Chicago, in the famous Dunes country, on Thursday, July 19. This unappreciated garden spot at the southern end of Lake Michigan has of late received so much publicity that undoubtedly all electrical men who can possibly do so will take advantage of this opportunity to visit the Dunes and see for themselves the many surprising things that can be found there. The varied sand formations are of special interest. Rare flowers, found in many distant parts of the world, thrive in the Dunes; cactus and other plants, which one would expect to find only in far off parts of the country, will greet those who make the trip. An effort is now being made to have the Dunes district converted into a national park.

The Dunes are about 22 miles in length and from one to two miles wide. About 20 years ago Octave Chanute made his pioneer flying-machine flights off a hill near the beach at Miller, so that this spot is practically the birthplace of the aeroplane, as the Wright brothers attribute their success with the aeroplane to Mr. Chanute's experiments.

Several special trains over the Illinois Central and the South Shore Electric Railroads will be run to Miller. The tickets will be $1.50 each. The net proceeds of the outing will go to the Red Cross. The usual games, sports and contests will be held and prizes awarded.

The following list of committees with the names

of the chairmen will give an idea of the extensive preparations that are being made for the outing:

General picnic committee, chairman, J. N. Pierce, secretary, Fred M. Rosseland; grounds committee, R. I. Phillips; transportation, Geo. C. Keech; refreshments, Walter E. Bishoff; souvenirs, G. W. Lunn; ticket sales, Paul Koch; wheel of fortune, Robert Cline; music, W. C. Berry; publicity, C. W. Forbrich; games, C. W. PenDell; swimming, H. G. Hafner; beach sports, W. M. Goodrich; advertising, G. A. Harter; bowling, L. C. Jones; prizes, Geo. B. Johnson; co-operation, H. A. Mott.

WAR-TIME DEVELOPMENTS IN ENGLAND.

New Electric Power-Using Industries Rapidly Developed, Especially Those Using Electric Furnaces.

In the Mobilization issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN* attention was directed to some of the effects of the war upon British electrical industry and to the new stream of tendencies that had been set flowing. We are now able to quote with certain detail some of the practical developments that have occurred in the department of power supply from public systems for direct war manufacturing operations.

WAR HAS GIVEN PERMANENT IMPETUS TO ELECTRICITY SUPPLY.

At the annual convention of municipal electrical engineers which took place in London on June 21 and 22, the president, F. M. Long, city electrical engineer of Norwich, dealt very optimistically with after-the-war electricity supply, because so much that has been introduced during the war will be continued after its conclusion. At present many stations are running up to the hilt without any spare plant whatever and it is a matter of great concern to them as to how the next winter's load is to be met. The greatest risk being taken is in respect of the boilers, as while a turbine may run for a long period without requiring any repairs, boilers must be taken off regularly for cleaning and inspection or trouble is bound to ensue. These and numerous other difficulties, notwithstanding electric supply is being maintained on a magnificent scale and with great efficiency.

Mr. Long anticipates that, great as has been the war-time development, demands for power will be still larger when the war is over. Though it would seem to be inevitable that when war demands fall away there must be a falling off in the demand for power, he believes that this will be for only a short period while reorganization takes place, owing partly to the vast arrears of industrial work that must be made up and the operations required to make good the ravages of war.

EXTRAORDINARY DEVELOPMENT OF ELECTRIC STEEL INDUSTRY.

Among the special industries which will inevitably bear lastingly the beneficial effect of the war is that of steel manufacture, which has afforded the electric furnace such an opportunity as it has never had before in England. Wherever the manufacture of steel is being carried on, electric furnaces are now being extensively used.

Mr. Fedden, city electrical engineer of Sheffield, England's famous steel industrial center, says that since the end of 1914 he has connected 27 steel furnaces ranging in size from 260 kilowatts to 3000 kilowatts, making a total of 27,350 kilowatts. Fourteen others are awaiting completion and connection. He estimates that at the end of April last, electrical steel was made at the rate of 85,000 tons per annum from the Sheffield electric supply system, making a total of approximately 100,000 tons per annum made in Sheffield.

In his belief the chief factor in electric furnace development at the commencement of the war was due to the enormous quantity of steel turnings and the numerous other turnings in connection with war material. "The majority of these turnings contain a good percentage of valuable alloys, and the greater portion of these would have been lost if the turnings had been melted in the ordinary steel furnaces. There is also a difficulty in dealing with these turnings in the ordinary steel furnaces, owing to their lightness and difficulty in handling, which is easily overcome in the electric furnace."

Mr. Fedden has found British steel manufacturers very prejudiced against trying any new developments, but he says that after their experience with electric furnaces they realize that they can make high-grade steel equal to crucible steel in ingots of almost any size. Further, they can carry out refining to any desired extent, and it is possible to make electric steel of a high-grade quality from raw material containing impurities, which would be impossible in either the Siemens or the crucible furnaces. Mr. Fedden's opinion, as quoted by Mr. Long, is that after the war considerable developments will take place in the manufacture of electric steel, as it is possible to make mild steel of a guaranteed less carbon than by other processes. This will enable motor-car castings, etc., to be much lighter.

Mr. Long asked a steel manufacturer for his opinion on electric steel, and he replied: "The advantages of making steel by electricity are that you can get a very much better control of the heat than in any other furnace, and that you are enabled to use turnings and other scrap in place of expensive hematite iron, for the production of high-class steel." Mr. Long added that steel furnaces had been installed in Birmingham, Bradford, Glasgow and other places and everything pointed to considerable developments in all steel-producing areas absorbing very large quantities of power.

ELECTRICAL PRODUCTION OF NITRIC ACID FROM THE AIR.

Other interesting developments were also detailed by Mr. Long. For example, there is being established at Manchester a factory for the manufacture of nitric acid from the air utilizing the new Kilburn Scott three-phase furnace. This plant will be of an experimental character requiring some 1000 kilowatts, but if it is successful it is expected to develop into a very large undertaking, ultimately requiring 15,000 kilowatts, and it will be a 24-hour per day load. The process consists in causing a current of air to pass through the flame of an electric arc in the heat of which oxygen and nitrogen combine, forming nitric oxide. This gas is cooled and allowed to oxidize, forming nitrogen dioxide, which is passed through absorption towers, where it combines with water, forming dilute nitric acid. This is a new industry so far as England is concerned. In the large developments in other countries the furnaces have been single-phase, connected in sets of three to utilize three-phase current, and the working of the new three-phase furnaces will therefore be watched with interest.

*May 26, 1917.

Another development at Manchester takes the form of a carbide factory which will ultimately take 10,000 kilowatts, mainly of an off-peak character, the estimated consumption being from 50 to 60 million kilowatt-hours per annum.

At Wolverhampton a factory for the manufacture of phosphorous is to start, with a demand for 4600 kilowatts at first and perhaps a further 4000 kilowatts. Also in the same city the manufacture of arcorundum has been begun, one 300-kilowatt furnace already being at work with another to follow shortly. There are other examples of electric furnace work which may not be referred to at present.

Mr. Long believes now that experience has been gained in England, there is every probability of a great development resulting in enormous demands for electrical energy. In addition to these larger possibilities, there are many smaller ones which in the aggregate will amount to a good deal.

MANUFACTURE OF ARTICLES FORMERLY IMPORTED.

Articles which were formerly imported from Germany and Austria are being made in many parts of the country and the factories will practically all be electricity consumers. At Wolverhampton there is a new large works (taking 200 to 300 kilowatts) for the manufacture of enamelled-iron ware of a class which used to cross from Germany. The manufacture of magnetos, glass and glassware and optical and other instruments are other types of new industries for home-made goods. Chemical industries, apart from those using electric furnaces, are very active on new lines. In the area of electric supply of one South of England undertaking, many projected works are to take from 20 to 300 kilowatts each, their demand aggregating 5½ million units per annum. These works will produce a substitute for aspirin, emollients and other fatty medicinal products, phosphorus compounds, coal-tar dyes, antiseptic and disinfectant products of the formalin class, plant for acetylene welding, acids, glycerine, etc. In the Midlands and elsewhere a number of firms are producing small articles from Lamp-holders to toys and fancy goods, formerly imported, and thus causing an increased demand for power which will not cease when the war does.

SOME ASPECTS OF UTILITY OPERATION DURING THE WAR.

Puget Sound Company Adopts Comprehensive War Policy.

The Puget Sound Traction, Light & Power Company, extensive operator in the Puget Sound Section, has formulated a policy to be followed during the period of the war. A number of meetings have been held by the heads of departments to discuss the necessary readjustments of the working force, having in mind the idea of making the entire organization helpful to the government, at the same time meeting the demands for community service.

A military census was taken as a preliminary to the work of readjustment, giving the company full information as to its employes, particularly as to their former employments. It is therefore supplied with an elastic, efficient and mobile force.

Much attention has been given to load distribution, that is equalizing as far as possible the demands for power for industrial purposes. Conferences will be held with manufacturers to readjust the closing hours and the changes of working shifts. By this means the peak load will be lightened and more current will be consumed during other hours. The purpose of the company is to place itself in readiness for whatever service the government may require and yet remain responsive to the demands of the communities which its properties serve.

The following is taken from a statement by President A. W. Leonard:

A new problem confronts the utility managers of the country. It is that of keeping pace with increasing industrial activity on the one hand with a material shrinkage in capital available for development or for any sort of public improvement on the other. The burden of the war must be carried through heavy taxes and the sales of bonds. The $7,000,000,000 which the people are asked to provide through taxes and purchase of war bonds during 1917 exceeds the total amount the nation as a whole saves each year for investment purposes. Thus it becomes apparent that the savings which ordinarily go to further the development of industry and into public improvements will be used to carry on the war. If this is true then there will be little, if any, new capital available for the extension of industrial or transportation properties, or even for any considerable public improvements.

To summarize the situation: The period of the war will be one of tremendous industrial activity with a correspondingly enlarged demand for labor, both skilled and unskilled.

The savings of the people invested ordinarily in industrial development and public improvements will be required almost wholly to carry on the war.

Millions of men must be diverted from the present channels of production and employed in ways that are unproductive, which is to say in the activities of war and those allied with war, or with the exclusive production of the vast machinery of destruction for the use of our army and navy. Drafts and enlistments, government departments, war relief organizations, the production and delivery of war supplies all will require armies of workers. Cantonments must be built, a great army equipped and drilled, munitions factories, ship yards, lumber camps, steel mills must be manned and operated to fullest capacity, and all of this must depend for success upon greater farming activity, for all workers everywhere must be fed. All of these activities must be paid for; which means that the money ordinarily invested in railroad, utility and municipal securities will be needed by the government, and this must result in a corresponding decrease in the amount of capital available for the extension of industrial enterprises or for public improvements of any character.

Great Britain has passed through the experience upon which we are now entering. The London Economist shows, in a recent issue, what happened there. In 1914 there was invested in public utilities in that country $66,500,000; in 1915 only $5,000,000 and in 1916 it dropped to $600,000. In 1914 the investment for the year in municipal loans was $15,500,000; in 1915 nothing and in 1916, $2,500,000. There has been no development there for three years of any industry that did not contribute directly to war requirements.

Sensing this situation the Puget Sound Traction, Light & Power Company is preparing to meet it by the adoption of a policy of readjustment of which the following are the essential features:

We will do our part to conserve both labor and capital for the uses of the nation and the successful prosecution of the war, which means that we will have to devise ways and means to hold down demands for

labor and capital and at the same time provide for large increases in business and service without making material increases in plant.

Exemptions from army or navy service will be asked for only such employes as are really needed to keep up adequate service.

To do this intelligently, our employes of the stipulated age qualifications will be grouped and studied and such changes made in their employment as will enable us to serve the government to the best of our ability, and yet not impair service. Men of engineering or construction experience, as far as possible and as fast as possible, will be spared, as they will be particularly desirable for government work.

Whenever a man leaves to enter the army or navy, we will first see whether or not a readjustment can be made so that his work may be handled by others in the organization, and if not, will employ a woman to take his place or move up some other employe and put a woman in the place of the employe so moved.

A careful investigation will be made in every department, with the purpose of discontinuing all operations which can be temporarily or permanently dispensed with without loss of efficiency or impairment of service. We will cut out detail, as far as possible, and devote our energies to essentials.

On all lines, wherever conditions warrant, we desire to encourage one-man operation of cars, believing it will result in better and more satisfactory service. However, no man need fear losing his job if he does his work, as there will be more than enough work for all available men.

We shall try to obtain the co-operation of power customers, through the readjustment of hours of closing and the changing of shifts, in decreasing present peak load requirements, and will devote our own business-getting energies to this end.

Renewals and replacements will have to be postponed wherever this can be done without serious detriment to service. Cost of such work at this time is excessive, and with no new capital available until government needs are fully provided for, the only funds upon which we could draw would be surplus from earnings. For the same reason, all construction work now under way must be discontinued as far as practicable.

Careful study and consideration will be given to all rates charged for service. Labor and materials are constantly increasing in cost, and rates may have to be higher, too. Thirty-six street railway properties in this country have recently increased rates, and other places have that matter under discussion. Unless some other readjustments can be made, increases will have to become universal.

We will ask city officials and public authorities in this state to study the situation and to aid us in carrying these policies into effect by giving us the benefit of their suggestions and co-operation.

OHIO ELECTRIC LIGHT ASSOCIATION TO HOLD ONE-DAY SPECIAL MEETING.

Meeting at Columbus, on July 19, for Transaction of Routine and Special Business.

Some time ago it was announced that the annual convention of the Ohio Electric Light Association, which usually is a four-day gathering at Cedar Point, Ohio, had been cancelled on account of the war. It has just been announced that in place of this meeting there will be held at the Deshler Hotel, Columbus, Ohio, on Thursday, July 19, a meeting of active members of the Association, or their representatives. This meeting is called for the purpose of electing officers and transacting such other business as may be brought up. The program is as follows:

Morning Session.—Round Table on Association work, including verbal reports and suggestions from chairmen of the standing committees. Special report of nominating committee.

Afternoon Session.—Round Table on central-station operation for 1917-1918. Election of officers.

D. L. Gaskill, Greenville, Ohio, is secretary of the Association.

AMERICAN ASSOCIATION OF ENGINEERS BROADENS ITS ACTIVITIES.

Enlarges Its Service Clearing House to Cover Consulting Engineering Requirements of Municipalities, Etc.

For nearly two years the American Association of Engineers has tested the rendering of service to technical engineers through its Service Clearing House. This department was established solely to place technical engineers in touch with employers. A record of qualifications is maintained through which employers may be introduced to men who in their opinion possess desirable qualifications. The average number of men placed in touch with vacancies has approximated 100 per month during the past two years. For this service not one cent commission was charged, the membership dues having defrayed all expenses.

The Association now proposes to broaden the scope of the activity by offering to the business men and men in public office the service of placing them in touch with competent consulting engineers to carry out any work of an engineering nature. Frequently municipalities desire engineering information, but they are at a loss where to get in touch with consulting engineers in whom they may have full confidence.

Given proper publicity, the Association believes that it can render a great service to the public, whether through municipalities or individuals, as well as to consulting engineers or firms of such. This method is considered the most logical and ethical one of increasing the demand for engineering work.

SPECIAL MEETING OF NEW ENGLAND SECTION, N. E. L. A.

One-Day Business Meeting at Boston Held on June 29.

In place of the annual convention of the New England Section, National Electric Light Association, which was scheduled to be held at New London, Conn., on September 11 to 14, a special meeting of representatives of member companies was held at Boston, Mass., on June 29. Most of the discussion related to problems affecting the central stations due to the war situation, and addresses on this subject were made by F. C. Wright and George B. Muldaur. The election of officers for the ensuing year resulted as follows: President, Arthur B. Lisle, general manager Narragansett Electric Lighting Company, Providence, R. I.; vice-president, George B. Leland, Stamford, Conn.; treasurer, Bowen Tufts, Boston, Mass.; secretary, Miss O. A. Bursiel, Boston, Mass.; executive committee, R. W. Rollins, Worcester, Mass.; F. A. Belden, Portsmouth, N. H.; H. L. Olds, Brattleboro, Vt.; C. R. Hayes, Fitchburg, Mass.; S. B. Tuell, Pawtucket, R. I., and E. F. Lawton, Hartford, Conn.

NEWS NOTES

Civil Service for City Electric Departments.—The Pennsylvania Legislature has passed a bill authorizing the adoption of civil service for electrical and other engineering departments in third-class cities in the state.

Rates Raised for Municipal Plant.—The City Council of Nicholasville, Ky., has advanced the electric rates from 7½ cents to 10 cents per kilowatt-hour for lighting service and from 3 cents to 5 cents per kilowatt-hour for power service. This is a municipal plant.

Right of Eminent Domain for Electric Companies, Pennsylvania.—The State Senate, Pennsylvania, is considering a bill introduced by Senator Daix, Philadelphia, according far-reaching rights of eminent domain to electric light, heat and power companies operating in the state.

Department of Commerce Issues Report on Cuba.—Plans for railway extensions, port improvements, building construction and engineering activities in Cuba are set forth in "Markets for Construction Materials and Machinery" in that country by the Department of Commerce, Washington, D. C. The information given will appeal to firms seeking markets outside our own borders. Copies of report can be obtained by addressing E. E. Pratt, chief of Bureau of Foreign and Domestic Commerce.

Comments Favorably on Coal Situation.—A. P. Lathrop, president of the American Light & Traction Company, considers that the utilities have seen the worst of the coal famine and that next winter will not find the utilities unprepared. He believes the agreement on coal prices should mean a blessing to the utilities, though of course it does not insure the amount of coal which may be needed. However, with the railroads putting all their coal cars into coal service, there should be a much better coal situation by fall.

Publications of Commercial Section, N. E. L. A.—The Publication Committee of the Commercial Section, National Electric Light Association, is planning to publish at cost for the benefit of member companies a series of booklets, pamphlets or folders dealing with show-window lighting, store lighting, electrical advertising, ranges and electric cooking, uses of electricity on the farm, electrical comforts for babies, a variety of seasonable campaign literature, etc. The idea is to publish such booklets, display cards, etc., in very large quantities and thus reduce considerably the expense of their preparation compared to publishing by private firms.

Western Washington Power Site Sold.—The Hebb power site on the White River, near Seattle, owned by the Mountain Development Company, of which P. H. Hebb is president, has passed to the control of the Western Washington Power Company for approximately $1,000,000. The transfer marks the end of numerous attempts made at various times over a period of years by both Seattle and Tacoma to acquire the site. The Western Washington Power Company is a subsidiary concern of the Puget Sound Traction, Light & Power Company. Any plan that the company may have had for developing the site has been delayed by the entrance of the United States into the war.

Municipal Electricians to Meet at Niagara Falls.—The 1917 annual convention of the International Association of Municipal Electricians is announced for September 11 to 14, inclusive, at Niagara Falls, N. Y. Members are asked to send suggestions for papers and topics to be discussed at the convention to the secretary. Later notices concerning the convention will be sent out by Clarence R. George, secretary, Houston, Texas.

Tax for Township Lighting Vetoed in Pennsylvania.—In disapproving a bill passed by the Legislature providing for the levying of a tax on residents of townships of the second class for lighting purposes, Governor Brumbaugh of Pennsylvania says: "Township supervisors can now make contracts for such lighting upon petition of the property owners in interest. To change this to taxable residents, as provided by the bill, would be an infringement upon the rights of those owning property. The present law is right and should not be changed."

Louisville Jovians in Annual Outing.—Elaborate preparations have been made by the Louisville Jovian League of Louisville for the third annual "boat ride" up the Ohio River on one of the river excursion steamers which has been chartered for the evening. In order to make sure that the expenses would be cleared, the Association sold each member two tickets, at 50 cents each, providing each member with numerous others as well for him to sell on a contract by which the League and the boat company split the proceeds. Many of the electrical appliance dealers donated presents to be given to the holders of lucky numbers, these ranging from a curling iron to a vacuum cleaner, and these helped to sell the tickets. Arrangements were in the hands of a committee headed by W. D. Myers, of the Louisville Gas & Electric Company, A. G. Renau, of the Childers Electric Company, and A. B. Allen of the Tafel Electric Company.

Alabama Technical Men Inspect Water-power Plant.—The Alabama Technical Association made an all-day excursion from Birmingham to the power house of the Alabama Power Company at Lock 12 on the Coosa River on June 30. This association comprises only Alabama members of the six most prominent national technical societies and was organized last winter for the purpose of maintaining an organization among the technical men of Alabama, to stimulate the development of the natural resources of the state, to foster public interest in all things beneficial to the state, to advance the interest of the technical profession, etc. This excursion was the first meeting held outside of Birmingham, which is the headquarters of the Association, more than half of the members residing in Birmingham or its suburbs, and this was the first meeting to which the ladies were invited. There was a short business meeting, after which the 90,000-horsepower water-power plant was inspected. The last 20,000-unit (the largest single-runner water turbine in the world) was started recently, and favorable comments were made by engineers familiar with large plants on the many excellent features connected with this installation. An inspection of the town site was also made and a delightful lunch served. The trip was made by train from Birmingham to Ida Station, from which point a barge carried the party of about eighty-five to the plant, this affording a fourteen-mile ride on the river each way.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

A SALES POLICY THAT HAS RESULTED IN PLACING 1600 RANGES.

Electric Cooking Activities of the Montana Power Company Largely Responsible for Remarkable Record Made.

The Montana Power Company, through its service and sales department, has met with good success in selling electric ranges in the principal cities and towns situated within the radius of its operations. The most pronounced success is in Billings, where 1000 ranges were sold between 1910 and 1915, and for the latter year 621 ranges were kept in service during the 12 months; and it is understood this record is being well kept up. In the cities of Bozeman, Helena and Great Falls a large number have been sold and kept in service. Over 300 are reported as having been sold in Great Falls. In that city the two leading hotels, the Rainbow and Park, have installed electric ranges, each one having 90-loaf bake and meat ovens, made by the Simplex Electric Heating Company, Cambridge, Mass. While Butte is a city where a good number of electric ranges are used, results there are divided between electric and gas ranges, as the Montana Power Company also sells gas in that field.

J. F. Roche,
Butte District Manager, Montana Power Company.

J. F. Roche, for several years manager of the company's Billings office, is now district manager at Butte, with 15 towns under his supervision. He is applying the methods in the larger district which were markedly successful at Billings. His scope is not confined to the electric range, as he regards the range as only a part of the complete electrification of the home. He maintains no "trouble department," because he says it gives the impression that the company keeps a smooth talker whose business it is to side-step real grievances. He wants all complaints adjusted promptly, and on the following day a woman at the telephone calls up each complainant to ascertain if all is satisfactory. Mr. Roche refuses to have "commercial department" applied to his field of activities, preferring to have it known as the "service and sales department," and in practice he insists upon the utmost courtesy toward patrons. Then, the slogan "Cook by wire," finds no place in the vernacular of the company's sales department. Mr. Roche substitutes "Cook by Electricity" therefor, and says to cook by "wire" is as illogical as to cook by "pipe," if you use gas.

Efficient and satisfactory service are made to coordinate with the sales function, and to accomplish this the high-priced, experienced men are kept at the front. All over the system the charge for current for domestic service is three cents per kilowatt-hour. The Hughes electric range is most widely used in this territory.

As a member of the Electric Range Committee of the Northwest Electric Light and Power Association, Mr. Roche has set forth his ideas on sales policies for merchandising the electric range and other home equipment in the following language:

"In my opinion the best method of selling electric ranges to the consumer is to have a thoroughly organized and enthusiastic sales department on all standard electrical appliances. I do not quite understand why so many central station managers, sales managers, solicitors and electrical magazines, in the development of the electric industry, are continually emphasizing the necessity of expending all their energies in the sale of the electric range. In the early development of the electric range, it was necessary, if the central station engaged in that branch of the business, to devote the greater portion of the solicitor's time in interesting the consumer. In fact it was necessary to have an electric range department, due to the undeveloped state in which the range came from the manufacturer. It was an absolutely new thing on the market, and the public had no idea that such a thing as cooking with electricity was possible.

"Today, the electric range is standardized, the same as is the wood, coal or gas stove, and we can tell our consumers that anything any other range will do, the electric range will do a little better. If we admit this to be the facts in the case, then we should have our solicitors and floor sales people imbued with the common sense idea that selling the electric range because it is practical, because it will deliver the full requirements of the consumer, and because it is necessary in the home, and not because it is a special device, requiring all of their energy and enthusiasm to induce the consumer to even consider it, is the main issue. In other words, go out and sell the range and deliver the service that you would like to receive yourself, which is my motto in merchandising the electric range.

"Prices, wiring, etc., necessary in the installation of the range in the home, should be the sale price to the

consumer. If there are many electrical contractors in the town in which we operate, the better policy would be to secure prices on installations of ranges, under average conditions, using that price as a basis for all installations and upon which your sale price would be made. It perhaps would be necessary to establish a difference account to determine whether the balance would be on the consumer's or the company's side. After operating under this system a sufficient length of time, it would be very easy to arrive at the actual cost of installation, to the extent that neither the company nor the consumer would suffer financially, in the one price to all system.

"Demonstrators, in my opinion, should be thoroughly posted on what all the standard appliances will do, even to an electrically-operated sewing machine, so that when she enters the consumer's home there is no question on which she will not be able to give an intelligent answer. A Home Economics Department, in connection with the sales department, should be developed to the extent that recipes covering all forms of pastry-cooking, bread-making, or in fact any other form of food preparation, are mailed each week, or semi-monthly, to consumers who have electric ranges, or electrical appliances of any kind in the home, that will take care of any one particular recipe.

"In large cities, annual electrical shows, where electrically cooked food is served, are the best methods of demonstrating to the people what this age is, insofar as electric convenience is concerned. Local conditions to a certain extent govern the actions of many of our central stations, if that central station is alive.

"Electricity is no longer a luxury. It is absolutely necessary for the convenience of the home. Therefore, instead of expending all of our energy on any one particular appliance, we should shoulder arms in defense of every electrical appliance that we know is standard and practical, any one of which, when placed in the home and is properly explained, will make inroads for another, which finally means the electrification of the home. This will bring returns, not only in dollars and cents, but also will eliminate from the public mind the 'soulless corporation' idea.

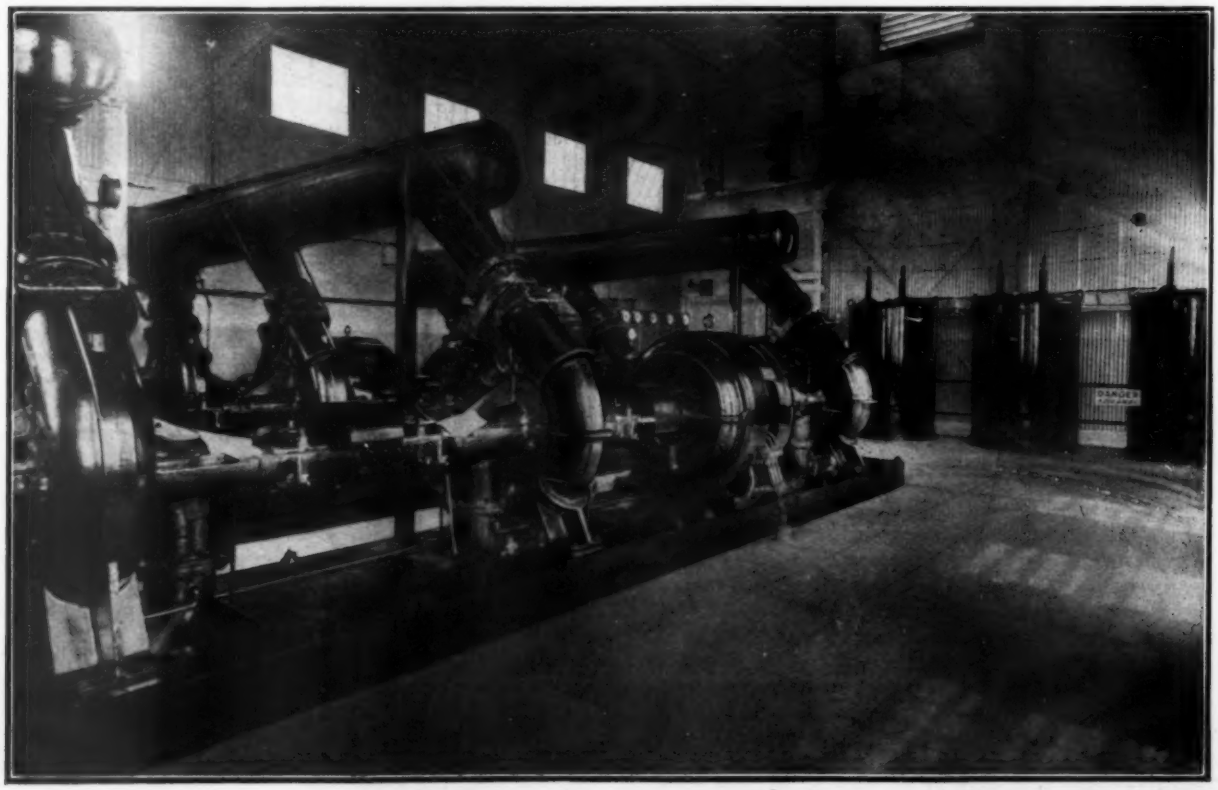
"Someone has said, 'When destiny can't win a man any other way, she always sends a woman and has never failed to land him.' Nothing will win the good will more quickly than convenient home equipment, coupled with golden-rule service. That kind of thing will win the confidence of the woman of the home and obtain her good will, to which the reasonable husband will and must agree."

ELECTRIC POWER APPLIED TO PUMPING FOR IRRIGATION.

Montana Power Company Has Developed Profitable Business in This Field—Customers Charged on Flat-Rate Basis.

The most conspicuous installations of electric pumping plants for irrigation in Montana are the two in use on Hauser Lake, in the vicinity of Helena. These are known as the North and South units, which supply water to irrigate 6000 acres of land in Prickly Pear valley. The lake is an expansion of the Missouri River, caused by back-water from Montana Power Company's Hauser dam.

The North unit pumping plant is illustrated herewith. It consists of nine Allis-Chalmers centrifugal pumps, each of 4500-gallons per minute capacity; the nine pumps are driven by three 600-horsepower motors, operating in three units. That is, each motor is coupled direct to three pumps, all operating at the same speed. The first motor, with its three pumps, is clearly shown in the picture; two pumps to the left and one to the right of the motor. Two other similar



Pumping Station of Montana Power Company, Comprising Three Sets of Pumps Driven by 600-Horsepower Motors.

parallel units are less distinctly shown in the same illustration. A close observation of the plant discloses that, under this arrangement, there are three pumps set in tandem, each driven by a different motor, and all working against a given head; and that there are two other similar settings of three pumps in tandem, making two different lifts. The first three in tandem at the left make a 70-foot lift to the lower canal; the next three in tandem pump against a head of 110 feet to the canal at a higher level; and the three in tandem at the right of the motors make a lift of 150 feet to the canal on the highest bench. Each pump intakes from the lake through a 14-inch suction pipe, and has a 12-inch discharge into a wood-stave pipe line, 36-inch diameter, the latter leading into open ditches. The motor shafts have a speed of 1200 revolutions per minute and pump connections are flexible, so that any pump may be disconnected.

The South unit, at another point on the border of Hauser lake, consists of two centrifugal pumps, equal to 16,800 gallons per minute, each driven by a 900-horsepower motor. These pumps make a lift of 163 feet into the same ditch system, through 48-inch wood-stave pipe lines, 916 feet in length. These plants were installed and are operated by Montana Power Company, current for which is derived from this company's power system. The farmers in the valley are charged for this service $1.75 per acre-foot, per season, the water being measured over the weirs.

New York Edison Company Announces Reduced Lighting Rate.

In style distinctly characteristic of its various advertisements, the New York Edison Company has published an interesting announcement in the New York City dailies covering its new lighting rate, as reproduced in the accompanying illustration. This announcement, attractively arranged in size 6¼ by 9 inches with ample white space, sets forth in individual manner the reduction in rate to 7 cents per kilowatt-hour, effective July 1, giving other information, as well, of interest and importance to consumers, such as rate schedules available at the company offices and the conditions covering the renewal of lamps, which latter is now included only under separate agreements with customers.

The company takes this opportunity to encourage the use of electric service for different household purposes, as ironing, cooking, cleaning, etc., thus employing the announcement for twofold object. To readily identify the advertisement as an Edison company announcement, the well known "Edison man" is placed in a prominent position. Advertisements of this nature indicate that progressive present-day spirit which serves to keep customers and others fully informed of existing conditions, and not only to facilitate company operations, but with well defined intent to assist and benefit individual consumers.

In connection with this announcement, it is interesting to note that the rate reduction from 7.5 to 7 cents is the second which the company has made during the present year, the rate having been lowered on January 1 from 8 to 7.5 cents, with the understanding that, if conditions warranted, the rate on July 1 would be 7 cents, as now placed in force, and to continue at such figure for at least six months. The company did not favor the reduction at the present time, owing to the great increase in the cost of materials, particularly coal, and the possibility that the war may tend to diminish extensive lighting at night with long-

An Announcement

On and after Sunday, July 1st, 1917, the maximum price for Edison Service on Manhattan Island and in the Bronx will be 7c a kilowatt hour The full schedule showing the several discount steps is on file with the Public Service Commission for the First District and at all of the offices of the Company. It may be conveniently consulted at these places or a copy will be mailed to anyone upon request

The rate does not include the supply of incandescent lamps, which may be purchased under a lamp renewal agreement at ¾c a kilowatt hour, or without reference to the use of current, at prices on file with the Public Service Commission, representing the cost of the lamps to ourselves

Our new rates make electric energy still further available for domestic uses, including ironing, coffee and toast making, vacuum cleaners, washing machines and many other purposes, through which the home may be more efficiently and economically conducted

The New York Edison Company

At Your Service

Irving Place and 15th Street—Stuyvesant 5600

Branch Office Show Rooms for the Convenience of the Public

Address	Telephone	Address	Telephone
424 Broadway	Canal 8600	151 East 86th Street	Lenox 7980
126 Delancey Street	Orchard 1960	15 East 125th Street	Harlem 4000
10 Irving Place	Stuyvesant 5600	362 East 149th Street	Melrose 9900
124 West 42d Street	Bryant 5262	Night and Emergency Call:	Farragut 3000

All Show Rooms Open Until Midnight

Newspaper Advertisement Announcing New Maximum Rates in New York City.

hour users. The lowering of the rates is estimated to aggregate a total reduction in revenue from this source of business of about $1,750,000 for the current year.

At the hearing before the Public Service Commission, First District, New York, it was shown that with the 8-cent rate the company earned $5,800,000 net, having an existing fund of about $60,000,000 in advance of expenditures. The figures presented by the company show that during the fiscal years of 1907-8-9 the company paid 6 per cent on $45,000,000 of stock; a like rate was paid in 1910 on $49,000,000; from 1911 to 1913, inclusive, on $50,000,000; and in 1914 on $60,000,000. On this latter amount 6¾ per cent was paid in 1915, and 7 per cent in 1916. Beyond these increasing dividends on increasing stock values, the company has enhanced its corporate surplus from $10,000,000 to $36,000,000 and its contingency reserve to $22,000,000.

It is said that the city plans to agitate a 6-cent lighting rate to become operative January 1, 1918, holding that the extent of the company's business and current revenues warrant such a reduced charge to consumers. On the other hand, in establishing the new 7-cent rate the company has reserved the right to restore the former rate of 8 cents per kilowatt-hour at the end of the year, as set forth in the following letter sent to the Public Service Commission by President N. F. Brady:

"This company, under the agreement which became effective January 1, 1917, has the option on July 1 of reducing its maximum rate to 7 cents per kilowatt-hour, or of returning to the former schedule under which the maximum rate was 8 cents a kilowatt-hour. We have endeavored to show that a reduction under the existing conditions is unwarranted, but the

Commission has held that it is warranted. We are, therefore, prepared to accept this decision and reduce our rates to 7 cents a kilowatt-hour, with the understanding that if the results are of an adverse nature we may exercise the existing option and restore our former schedule of 8 cents a kilowatt-hour on January 1, 1918. If this arrangement meets with your approval, we will file a new schedule at once under which, as indicated, the maximum rate will be 7 cents a kilowatt-hour on and after July 1, 1917."

Boston Edison Company Conducting Iron Campaign.

The Edison Electric Illuminating Company is conducting an electric-iron campaign in its territory, offering to customers a $5.00 iron and stand for $4.50, on the basis of 50 cents cash and 50 cents per month.

Big Edison Campaign Special

GENERAL ELECTRIC FLAT IRON

(Guaranteed)

A Bargain Price of $4.50, payable 50c down and 50c per month deferred payments

Latest 1917, Household, Quick Heating, Heel Stand Model, $5.00 value, at $4.50. This bargain special to our customers only; others cash.

This campaign special, with its very liberal terms, makes it easy for every *Edison Customer* to own a genuine G-E electric iron.

You have never had this opportunity before; you may never have it again.

Do you realize

that the saving made on the weekly laundering, or the laundering of just a piece or two (a Georgette Crepe Collar, or a delicate piece of lingerie) will mean economy, and will more than pay the small monthly payment of 50c? Aside from the economy and saving, think how trim and fresh looking these little essentials may be kept, and best of all you can have them just when you want them, if you own a G-E iron.

You are under no obligation to buy. We want every *Edison Customer* to see and try the latest 1917 Household—Quick Heating—Heel Stand Model—General Electric Flat Iron.

No fumes, no nauseating odor

The G-E iron is one of the Most Economical Labor-Saving Devices ever placed in the home; no home should be without one. Thousands of steps saved on ironing day. Hot Summer with its dreaded ironing days can be made much more pleasurable, if you use the G-E iron.

If you are an Edison Customer you have the opportunity of securing, during this special campaign, the genuine G-E iron at a bargain price of $4.50 by simply paying 50c down and 50c per month. No home can now afford to be without an electric iron. Our campaign special with its liberal terms is your opportunity but you must be an *Edison Customer*

REMEMBER

This is a special campaign; the offer is of a bargain price, the terms are the most liberal we have ever offered and the electric iron is a genuine 1917 Household—Quick Heating—Heel Stand Model—G-E Flat Iron.

Telephone Beach 3300 or any of our Branch Stores, or mail the enclosed postal; do it now, today, because it is necessary to own a G-E iron.

BRANCH STORES

Waltham	Waltham 1660	Hyde Park	Hyde Park 286	Wabern	Wabern 320
Needham	Needham 120	Arlington	Arlington 360	Newton	Newton N. 184
Brookline	Brookline 3300	Framingham	Framingham 620	Bellevue	Bellevue 160
W. Somerville	Somerville 61	Chelsea	Chelsea 68	Natick	Natick 340
Lexington	Lexington 330	Winchester	Winchester 1040	Medway	Medway 69

The Edison Electric Illuminating Company of Boston

39 Boylston Street

Telephone "Beach 3300" 19 Other Stores

Circular Which Boston Company Is Distributing in Iron Campaign.

The circular shown in the accompanying illustration has been sent to each of the company's customers, and with it a self-addressed return postal card, for the convenience of the customer in ordering the iron.

Central-Station Service Effects Economies in Printing Plant.

Progressive printers are beginning to realize the manifold advantages of electric drive for their printing shops. They readily perceive how easy it is to eliminate the long lines of shafting with belts to each machine, dripping oil, difficulty of speed changing and the lack of economy in running all the shafting when it is desired to operate only one machine.

By the use of individual electric drive, machines may be located in the most convenient places for the work they are to perform, rather than in a row so as to be driven from one line shaft. In this manner, each operator can run his machine regardless of the others.

Group of Presses Driven by Individual Motors.

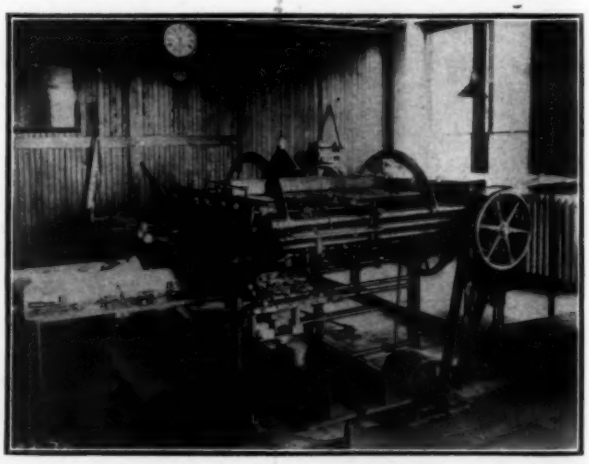
The shop of Kohn & Pollock, Baltimore, Md., is an excellent example of the improvement to be secured from the electrification of a printing plant. This plant was formerly located in comparatively cramped quarters where the lighting facilities were not the best and power was supplied to all of the machines through one shafting.

Some time ago, however, they installed individual motor drive throughout the plant and purchased electric energy from the local company on a meter basis, whereas previously they had been paying a flat rate of a certain sum per month regardless of the amount used.

Since the installation of individual motor drive, the average cost of energy per month has decreased, and in addition, when the output of the plant was curtailed for any reason, the power bill was decreased in proportion, which, of course, was not true under the former system.

The electrical equipment of the plant includes 15 constant-speed direct-current Westinghouse motors, aggregating 21.5 horsepower.

These motors are either shunt or compound wound according to the nature of the work to be performed. The type of motor employed has characteristics particularly adapting it to printing-press work.



Motor-Driven Folding Machine.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

To Prevent Oil Syphoning over Conductors from Transformers.

By F. S. Fletcher.

The syphoning of transil oil from oil-filled electrical apparatus is as old as the use of transil oil. The oil syphons up the leads and seeps over apparatus and floors, causing stickiness, the collection of dirt and dust and stains, all of which are undesirable. But, more important still, the presence of oil is often harmful in that it causes the rapid deterioration in both mechanical and dielectric strength of rubber and insulating materials containing it, while the collection of dirt tends to cause grounds and breakdowns. Syphoning of oil is always undesirable and is best attended to when the apparatus is being placed in service.

In the Electrical Review and Western Electrician of March 10, 1917, a contributor described a method of preventing syphoning by injecting glycerine into the strands of the cable. Glycerine is not always on hand, and it is thought there is no assurance that such a practice would be of permanent effect, hence other methods may sometimes be preferable. The oldest way to prevent syphoning is undoubtedly to cut back the insulation for one or two inches and solder the strands together as this prevents the oil oozing through the cable strands by capillary attraction.

Another way, somewhat more troublesome to accomplish but more satisfactory, consists of introducing an air gap between the conductor and the insulation. This can be done by cutting back the insulation three to six inches, soldering the intervening space so that all the strands of the cable are made into one solid mass, and covering the whole with a sleeve of insulating material in such a way that an air gap exists between the soldered conductor and the inside of the insulating sleeve. When in place the sleeve is wrapped with insulating cloth or tape, which holds it in place. If one more refinement is desired, it is well to drill two or three holes, each about ⅛ inch diameter in the sleeve, leaving them "open" or uncovered when putting on the wrappings of cloth or tape. A joint made in this way will have a somewhat larger outside diameter than the rest of the cable, but it will have as high insulating qualities as the remainder of the cable, there will be no naked parts exposed, and syphoning will be surely prevented. If it is inexpedient to open the conductor to permit of slipping the sleeve onto the conductor, the sleeve may be made in two longitudinal parts which are applied to the conductor and then tied in place by the wrapping.

Telephone Head Receiver Set for Simple Testing of Bells, Buzzers, etc.

By Charles N. Albrecht.

In a recent issue of the Review, I find an item regarding an improved battery test for bell, buzzer and telephone wiring troubles. This has been my line of work entirely for some time and in it I find nothing more useful than a headband telephone receiver of about 250 to 500 ohms resistance. I use the same type of receiver as employed by telephone operators. The reason I use the headband type is because this allows free use of both hands for testing.

Take door bell trouble, for instance. I remove the cover from the push button, touch one cord end to each terminal and listen. If I get a sound in the receiver, I know at once that the circuit is clear and the wiring all right. If I get a frying noise, I know there is either a loose joint or poor contact on the bell. If all is clear, I push the terminals together to ring the bell with my receiver cords still on; if, when the contact is released, I hear a sharp back kick in the receiver, I know that the bell is either short-circuited or the tension on the clapper is too great. If I hear a rattling sound, I know that the bell has been

Headband Telephone Receiver Set for Bell Testing, Etc.

ringing. If every operation produces but a very faint response in the receiver, I know that the battery is weak. If the circuit seems to be open and I know that the battery is good, I short-circuit the push button with my screwdriver and test with the receiver connected across the bell.

After a little practice the trouble man can soon find very many uses for a receiver of this kind. By this push-button test method, I can nearly always locate the trouble before I even knock on the door and to be able to remedy a fault so soon makes a very good impression on the customer. In fact, I have won considerable favor by using this simple method.

For this purpose never use a double-receiver headband, but a single one so as to have one ear free for listening to outside noises.

Electricians Must Procure Licenses.—State Board of Electricians, of North Dakota, created by the legislature, met July 1 at Bismarck, and elected W. S. Hulet, Minot, president, and Harry L. Reade, the state fire marshal, secretary and treasurer. The law, which went into effect July 1, requires electricians to procure licenses from the State Board.

Causes and Effects of Local Short-Circuit Current

Discussion of the Serious Commutation Troubles Due to Short-Circuit Currents in Brushes, Between Brush Studs and Between Parallel Machines—Remedies Suggested

By E. H. MARTINDALE

Chairman, Industrial and Domestic Power Committee, A. I. E. E.

This is the ninth of a series of 14 articles on the solution of commutator and brush troubles. The series began in the issue of March 24 and appears at intervals of two weeks. The earlier articles of the series were devoted to brush characteristics and a general discussion of commutation troubles followed by a detailed consideration of some of the principal troubles. In the present and remaining articles other troubles due to a variety of defects and their remedies are discussed.

MORE serious commutation and heating troubles with motors and generators are due to local short-circuit currents than to any other one cause. There are three general forms of local-short circuit currents: First, where the current is confined to a single stud either in the individual brushes or between two or more brushes on the stud; second, between two or more studs of the same polarity; third, between two machines operated in parallel. In this article these will be designated as "brush short-circuit currents," "stud short-circuit currents" and "machine short-circuit currents."

In all of these cases the power loss is low because of the low voltage back of the short-circuit current, but the heating of the armature and the heating and burning of the commutator are severe.

Brush Short-Circuit Currents.

Brush short-circuit currents are the most frequent and may be due to brushes being too thick, brushes not being operated at the electrical neutral, the use of brushes with too low contact drop, non-uniform assembly of brush holders on a stud, crooked brush studs or twisted commutator.

The previous article* in this series discussed fully brush short-circuit due to brushes too thick.

Brushes not operated at the electrical neutral or the use of brushes with too low contact drop have the same effect as the use of brushes too thick, that is, the voltage across the brush is high enough to develop an excessive current in the coils short-circuited by the brush. As explained in a previous article, the electrical neutral may be different at one stud than at another, due to an inequality in the air gaps, field windings, or spacing of the field poles.

Fig. 1 illustrates two of the general causes that permit the brush short-circuit currents in individual brushes. The small figures represent the voltage gen-

*"Brush Spacing and Brush Thickness," Electrical Review and Western Electrician, June 30, 1917.

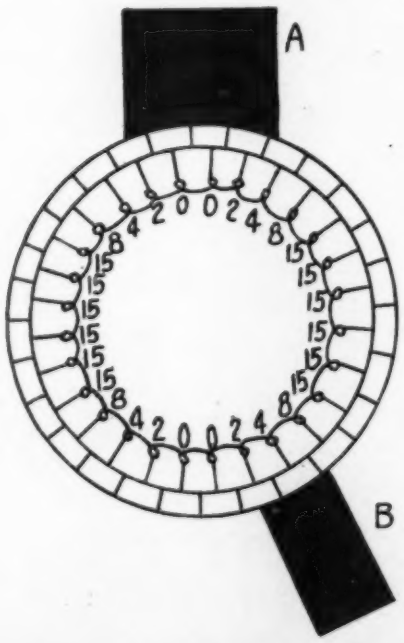


Fig. 1.—Two Causes of Brush Short-Circuit Currents—Excessive Brush Width and Incorrect Brush Position.

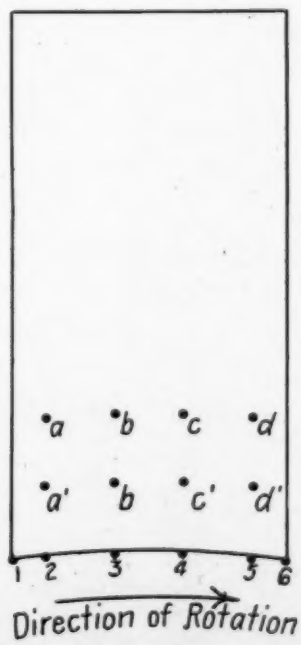


Fig. 2.—Location of Test Points on Brush Tested for Short-Circuit Currents.

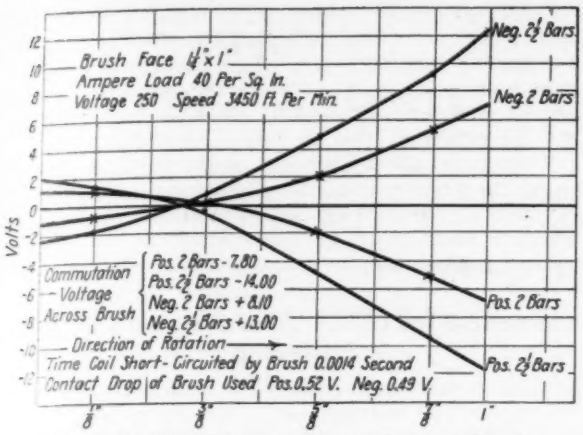

Brush Face ¼"x1"
Ampere Load 40 Per Sq. In.
Voltage 250 Speed 3450 Ft. Per Min.
Neg. 2½ Bars
Neg. 2 Bars
Pos. 2 Bars
Pos. 2½ Bars
Volts
Commutation Voltage Across Brush
Pos. 2 Bars - 7.80
Pos. 2½ Bars - 14.00
Neg. 2 Bars + 8.10
Neg. 2½ Bars + 13.00
Direction of Rotation
Time Coil Short-Circuited by Brush 0.0014 Second
Contact Drop of Brush Used Pos. 0.52 V. Neg. 0.49 V.

Fig. 3.—Voltage Between Commutator and Brush.

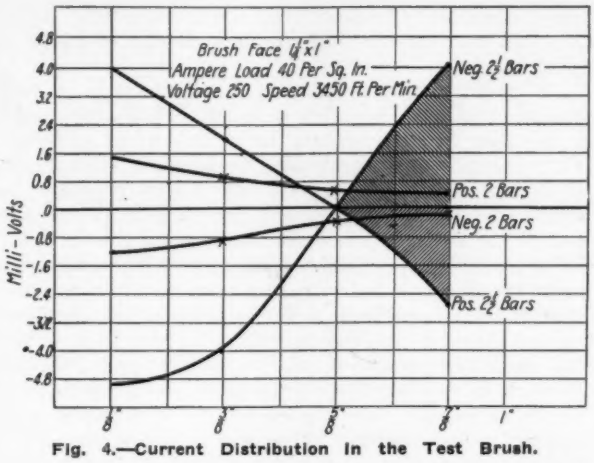


Fig. 4.—Current Distribution in the Test Brush.

erated in each coil. Brush *A* is too thick, that is, spans too many bars. Brush *B* is not operated at the electrical neutral, due to incorrect position of the brush.

Tests to Show Short-Circuit Currents.

The writer very recently conducted some tests to show the short-circuit currents in a brush due to operation away from the neutral point. The brushes were tested on the 100-kilowatt, 250-volt, six-pole General Electric type MP generator, that was illustrated in the article in the issue of June 30. The brushes, which were 1 inch thick, were carefully marked, as shown in Fig. 2, the marks being at ⅛, ⅜, ⅝ and ⅞-inch from the toe of the brush, the lower row being ⅛ inch and the upper row ⅜ inch from the face of the brush. Tests were conducted on both positive and negative brushes.

With a low-reading voltmeter measurements were taken between the points *aa'*, *bb'*, *cc'* and *dd'* to determine the relative value and direction of the current flowing in the brush. With a 15-volt voltmeter, measurements were taken of the voltage between the brush and the points, *1*, *2*, *3*, *4*, *5* and *6* on the commutator, corresponding to the edges of the brush and the points *a*, *b*, *c* and *d*.

Fig. 3 shows the voltage obtained between the brush and the commutator at 2 and at 2½ bars lead. Fig. 4 shows the relative currents in different sections of the brush at the same lead.

The time required for a commutator bar to pass under the brush was 0.0032 second, but the time a coil was short-circuited by the brush was only 0.0014 second. From Figs. 3 and 4 it will be noted that at 2 bars lead the voltage tending to reverse the current in the brush reached 7 volts, but the time of short circuit by the brush was not long enough to enable this voltage to overcome the inductance of the coil. At 2½ bars lead the reversing voltage reached 12 volts, and this higher voltage reversed the current at the ⅝-inch point, or a little beyond the center of the brush. The shaded portion of Fig. 4 (2½ bars lead), combined with an equal area of the unshaded portion is short-circuit current and is equivalent to about twice the balance or line current. The voltage on the commutator across the brush, that is, the voltage between points *1* and *6*, called "commutation voltage," for 2 and 2½ bars lead, is also given on Fig. 3. This brush would operate much better if the thickness were reduced ⅛ or ¼-inch, as this would reduce the commutation voltage as well as the time of short circuit by the brush.

Fig. 5 shows a plan view of a commutator on which the brush stud is not parallel to the commutator bars, which may be due to a crooked brush stud or to a twisted commutator. A few small machines have been manufactured with twisted commutators to secure better commutation, but in such cases the designer has made proper allowance for the short-circuit tendency. In this case the path of the brush short-circuit current is from one brush up through the stud and down through another brush and has nearly the same effect as the use of a brush too thick. The same effect may be produced by the non-uniform assembly of brush holders on a stud. That is, one brush holder may be rotated too close to the commutator and another too far from the commutator so that one brush will bear on the commutator considerably ahead of the other.

Stud Short-Circuit Currents.

Stud short-circuit currents may be due to unequal spacing of brush studs, inequality in field-pole spacing, variation in length of air gaps, error in field windings or unbalanced armature winding. The methods of locating and correcting incorrect brush spacing were described in the previous article (issue of June 30). Stud short-circuit currents due to the various field troubles and air gap troubles were discussed in the article on "Field Troubles" in the issue of June 2, 1917.

Machine Short-Circuit Currents.

Machine short-circuit current between two generators operated in parallel is generally limited to generators driven by reciprocating engines and is more frequent in gas-engine than in steam-engine driven units. The trouble is caused by the variation in angular speed of the engine which causes a higher voltage to be developed at one part of the revolution than at another part, and as it is practically impossible to keep the engines running in synchronism, the high voltage on one machine will, part of the time, occur coincident with the low voltage of the other machine, thus permitting a short-circuit current between the two. This trouble can sometimes be overcome by a change in the valve adjustment, but in other cases may require a heavier flywheel.

Effects of Short-Circuit Currents and Their Remedies.

All of the short-circuit currents described generally cause more or less severe sparking, often cause flat spots and on unslotted commutators generally result in high mica. Where the causes cannot be en-

tirely eliminated, undercutting the mica will be found of great assistance in helping keep the commutator in good condition.

A pitted or honeycombed brush face is a sure indication of a too high line current for the brush used, a too low brush pressure or short-circuit currents. The pitting is very rarely due to too high line current. It is frequently due to too low brush pressure, in which case the brush face will generally be pitted over nearly the entire surface and the rest of the face will have a dull, unpolished appearance. The pitting is most frequently due to short-circuit currents in which case there is generally a fairly definite line between the pitted and unpitted portions of the face. Also the unpitted portion is usually fairly well polished. In such cases do not write to the manufacturer for a brush of higher carrying capacity, as that will only aggravate the trouble. What will help is a brush with higher contact resistance or contact drop to cut down the short-circuit currents. If a brush taken from the machine is sent to a brush manufacturer, his engineers can generally tell the cause of the pitting from the appearance of the face.

To sum up the effects of short-circuit currents, we may say they cause sparking, commutator wear due to

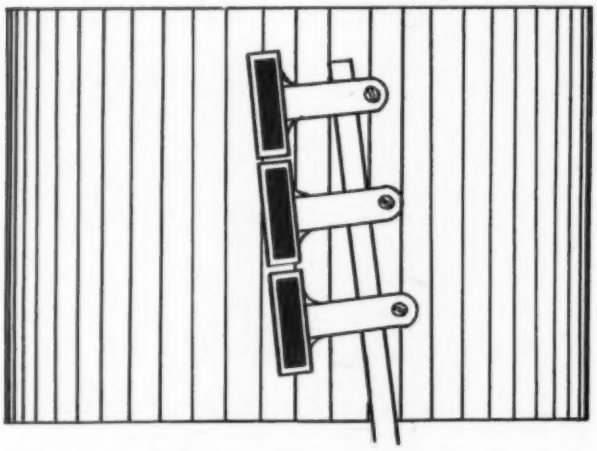


Fig. 5.—Plan View of a Commutator With Brush Stud at Angle.

burning, high mica, flat spots, rapid wear of brushes, picking up copper on brush faces, heating of commutator and armature, which reduces the permissible load on the machine and, in the case of stud or machine short-circuit currents, often causes the failure of the shunts or pigtails attached to the brushes.

Simple Remedy for Bearing Trouble.

By Robert Oster.

An alternator which had been throwing oil from one of its bearings and thereby was damaging the face of a marble switchboard, because the location of the machine caused the oil to strike the board, was cured of the difficulty in the following manner:

The machine was of stock type and made with pedestal bearings; fan blades at the end of the rotor that were intended to circulate air through the coils were found to have a very strong suction effect on the oil in the bearing. In fact, an oil-deflecting ring did not wholly counteract the suction on this oil. The bearing was examined carefully and found to be in good condition and the oil in it of specified grade. The pedestal casting of the bearing housing had a lid-covered slot. The babbitt or bearing casing had an open round hole through which the bearing was oiled and the oil ring inspected. This latter hole was covered with a disk-shaped piece of metal to which a looped wire was attached to allow of easy removing for inspection of the oil ring. This disk prevented air from circulating through the bearing and eliminated the suction action of the rotor fan from drawing out any oil. This simple remedy was entirely effective and caused no appreciable rise in temperature of the bearing.

Contractors and Others Unite to Promote Continued Building.

Contractors in the building trades of Louisville, Ky., have just inaugurated a movement by which it is hoped that they can "wake up" the people of the city to the desirability of continuing building projects. The movement was started at a meeting called by Brinton B. Davis, architect and president of the Louisville Engineers' and Architects' Club, held at the club headquarters. A committee named to work out a plan to combat the "false economy hysteria" is holding meetings, and includes J. O. Bland, of the Bland Electric Company and representative of the Electrical Contractors' Association.

Talks were made at the meeting and full publicity given in the Louisville papers by Captain Davis and others. All of these talks were directed toward combatting the inclination of the people to stop spending money. Captain Davis discussed the reasons for the immediate curtailment, one of which he said is the increased cost of building materials. Then he went on to point out that there would be no reduction in the prices of materials for a number of years after the war is over. Stress was laid by all the speakers on the fact that true patriotism means, among other things, that all people should do their part in contributing to the general prosperity. Another reason that was much urged was the coming of some 50,000 soldiers to Louisville for training in the early fall. Unless there is something done and done soon it will be found that Louisville will not be in a position to take care of the visitors who come to see the men at the camp.

Among the Contractors.

The Turner Company, San Francisco, Cal., has been awarded a contract for an electric lighting system for a brigade cantonment in the Presidio Reservation, San Francisco.

The United Electric Company, 3 Hanford Place, Caldwell, N. J., has filed notice of organization to operate as electrical contractors. Elmer F. Reeves, Eagle Rock Avenue, Roseland; and J. P. Campbell, 346 Bloomfield Avenue, Caldwell, head the company.

Louisville, Ky., electrical contractors, along with contractors in other lines, have been asked by F. M. Sackett, president of the Board of Trade, which was instrumental in locating the army camp at Louisville, to spare all the men they can for work at the camp. Federal officers in charge of the construction have joined in the appeal. It is represented to the contractors that the Government must have the labor but does not wish to be in the attitude of demoralizing local wage conditions by paying a higher scale than that prevailing in order to get the men from local employers or to bring others in from outside.

New Electrical Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Geyser Electric Washer Now Provided with Swinging Wringer.

One of the most important developments in the line of electric washing machines was the Geyser electric washer, which has been on the market for several years, during which it has demonstrated that its seemingly radical departure from the ordinary washer operating methods really makes for efficiency, simplicity and safety in clothes washing. The manufacturer of this washer, the Capital Electric Company, 321 North Sheldon Street, Chicago, has maintained this propeller-pump principle or geyser action in each of its models, which have been described in our columns as they were brought out. The company has continued to improve various features of the Geyser washers, however, and one of the new features just introduced is the swinging wringer.

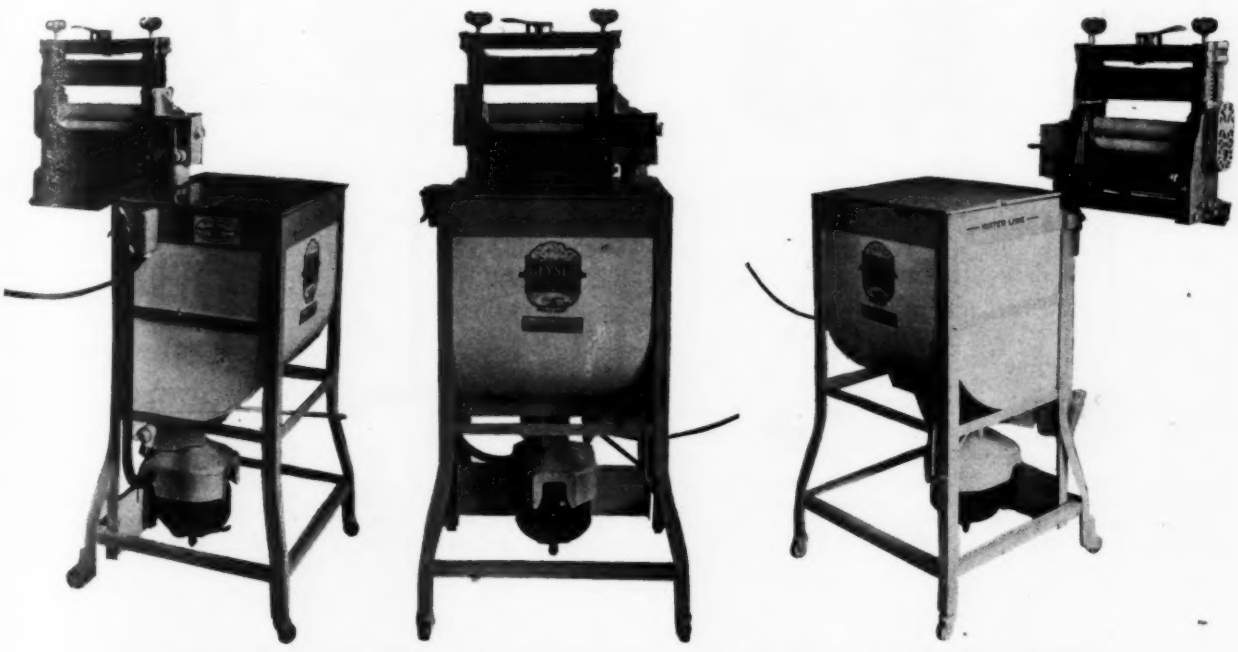
The Geyser new swinging wringer is arranged so that it can be swung into any of three positions, making it convenient for continuous operation of the clothes from the washer to the rinse water, to the bluing water and out of the bluing water to the basket.

The wringer is supported on and connected to the machine by a substantial casting bearing on a rigid support. The wringer is braced in every way to such an extent that an ordinary man can place his weight on the end of it without overbalancing it.

The wringer is locked in all three positions by means of a key operated by a lever. This key registers in three slots cut into the casting which is rigidly fastened to the wringer. As each slot is carried around to the key, the latter drops in automatically and locks the wringer in that position. To swing the wringer to the new position, all that is necessary is to press the lever, releasing the key, and the wringer can be swung around to either of the two other positions.

The new wringer is provided with a detachable drainboard that can be placed on either side of the wringer or can be taken off entirely, if desired. The wringer itself and all its parts can be lifted entirely away from the washer and put away, if desired, so that the washer proper takes up very little space and could be covered with a special bag and be used for a table in the kitchen or wherever it is placed.

Other new features added to this washer are the waterproof switch box fastened directly to the washer, and the grooved legs which flare out to make the washer very stable by giving an enlarged base.



Geyser Electric Washer, Family Size, Shown with Wringer Swung to Three Operating Positions.

Replacing the Arc Lamp in Stage Lighting by 1000-Watt Nitrogen-Lamp Equipment.

For the past thirty years the electric arc has been used almost exclusively for stage lamps and lighting effects because of the absence of any other form of light which could compete with it in power, brilliancy and ease of control. While the arc lamp with its concentrated, high-intensity illumination reflected

from the positive crater will probably never be entirely replaced for long-distance light projection, such as for long-range spotlights, stereopticons and motion picture projecting machines, in shorter-distance work and wider-spread illumination it is finding a rival in the 1000-watt concentrated-filament nitrogen-filled tungsten lamp.

The accompanying illustrations show standard types of lamps used in stage lighting which are now being furnished with 1000-watt nitrogen lamps. Because of the greater advantages of these lamps many theaters and theatrical companies are turning in their old lamps to be replaced or equipped with nitrogen bulbs.

The advantages are much greater simplicity and lower current consumption. They operate equally as well and efficiently on alternating current as on direct current, the light is constant, requiring no feeding of carbons, and no operator is required, except in the case of spotlights, where the beam of light must be made to follow the individual or group on which it is stage. These screens are entirely eliminated in the nitrogen lamps.

The housing of the nitrogen spotlight is practically the same as the arc type, with the exception of the provision of the lamp socket, which slides backward or forward for focusing.

Fig. 2 illustrates the nitrogen "sciopticon," which is really a motion-picture machine used to produce special lighting effects, such as falling rain, snow, fire, running water, moving clouds and the practically infinite number of combination effects, such as rising or setting sun with stationary or moving clouds, rain effect with moving clouds, etc. These effects are produced by the revolving of a specially designed disk or combination of disks through the beam of light from an ordinary spotlight, provided with additional projector lenses. The disks are driven by clockwork shown on the case of the sciopticon.

Fig. 3 illustrates what is known as an open box light. This is usually placed in the wings of the stage for the general bright sunlight flood illumination of

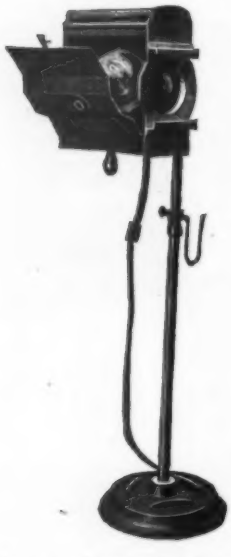



Fig. 1.—Standard Spotlight Fitted with 1000-Watt Concentrated Filament Nitrogen Lamp.

Fig. 2.—Nitrogen Sciopticon for Producing Special Stage Effect, Such as Moving Clouds, Etc.

Fig. 3.—Latest Type of Open Box Light with 1000-Watt Lamp.

Fig. 4. — Glass-Lined Reflector with 1000-Watt Lamp for Brilliant Flood Light.

Fig. 5.—Daylight Flood Light with 1000-Watt Lamp and Special Light Shield.

directed or where color slides or wheels must be operated.

For stationary work, where the direction of the illumination need not be changed, the lamps can be thrown on and off directly from the stage switchboard.

The simplicity of the new lamp as compared to the old arc type is illustrated in the spotlight shown in Fig. 1. The absence of the large balance resistance usually placed at the bottom of the stand, and the large, heavy current switch are immediately noticeable. As shown, no resistance whatever is required. The adjustable resistance shown in Fig. 1 is used only as a dimmer, where it is necessary that the light must be increased or decreased gradually. Also in certain states and cities, especially in the city of Chicago, the local regulations require that a screen, hood or guard, known as a Chicago screen, must completely inclose the housing of all arc-type lamps used on the the stage and settings. These lamps are fitted with slide holders for glass or gelatin color frames for changing the color of illumination as necessary.

Fig. 4 illustrates the Kliegl glass-lined reflector, which is usually placed in the wings of the stage, similar to the box light and used for special bright illumination of parts of the scenery, setting or groups. They are also used without the iron stand for suspension in rows above the stage behind the short drops and supplied with color mediums for general color illumination. The reflector, as its name implies, is made of small strips of plain mirrored glass set in a parabolic-shaped case. This reflector has the diffusing characteristics of a corrugated reflector and gives a widespread, brilliant flood of light for short-range work. In case of breakage of parts, however, it is easily repaired by replacing the broken pieces of mirror. The advantages of this unit as well as the box light, fitted with the 1000-watt nitrogen lamp,

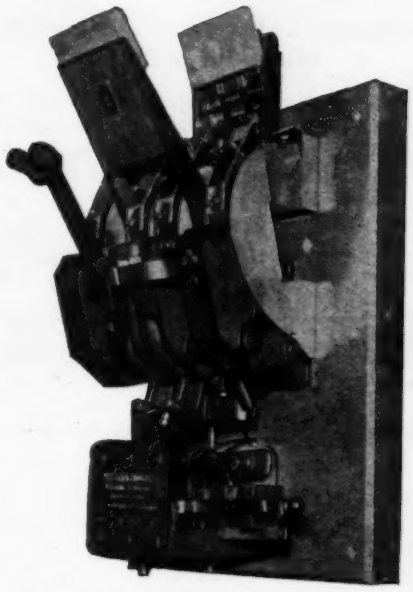
compared to the arc-type lamps are that they require no operators, except for color changes and can be controlled from a central point.

The Kliegl daylight flood lamp, Fig. 5, is especially designed for the distant projection flood lighting required in outdoor theatricals and pageants. This lamp is likewise fitted with a 1000-watt nitrogen lamp, set in the rear of the long housing to completely inclose the lamp. A parabolic-shaped polished metal reflector mounted on an adjustable rod provided with a wooden knob shown at the back of the lamp permits focusing for a broad or narrow beam of light. The entire interior of the lamp is painted in dull black, as well as the special cylindrical light shield shown in the center of the housing. This cylindrical shield projects back into the housing, up to the lamp, and practically all of the light is focused through it. The purpose of this shield and the darkening of the interior is to eliminate glare on looking in the direction of the lamp and making the source of illumination invisible from any point other than the area illuminated. The special characteristics and efficiency of these lamps were shown in illustrations of the flood illumination of the mammoth pageant "Caliban," produced last year in the stadium of the College of the City of New York; this was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 9, 1916. The bright illumination of the central ring was produced by a battery of 30 of the daylight flood lamps placed high above the audience on the arcade of the stadium, the distance from the lamps to the center of the ring being over 200 feet. The special feature of the light screen was illustrated in the clear definition of the illuminated area, while the surrounding ground and audience are in darkness.

The lamps described above were designed and are manufactured by Kliegl Brothers, proprietors of the Universal Electric Stage Lighting Company, 240 West 50th Street, New York City.

Record Order for Large Carbon Circuit-Breakers.

For use in new substations and in additions to its existing ones, made necessary by the 170 miles of subway and elevated extensions in New York City, the Interborough Rapid Transit Company has ordered 505 Westinghouse carbon-break circuit-breakers ranging in capacities from 1000 to 12,000 amperes. Included are: 196 600-ampere hand-operated breakers with overload trip, mounted on panels with 2400-ampere knife switches, for the direct-current feeders; 98 12,000-ampere breakers for use with 4000-kilowatt rotary converters; 14 8000-ampere and 45 4000-ampere breakers, for use with 3000-kilowatt and 1500-kilowatt rotary converters, and smaller sizes for equalizers and auxiliaries.

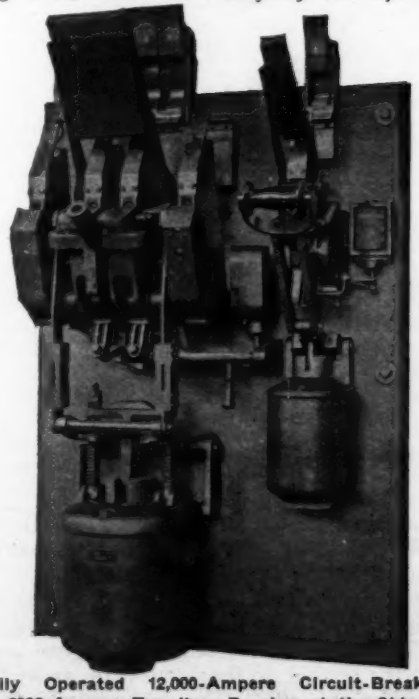


Carbon-Break Circuit-Breaker With Reverse-Current Mechanism, Rating 12,000 Amperes.

The scheme of operation for the 4000-kilowatt rotary converters is interesting. Three 12,000-ampere breakers are provided for each machine. A hand-operated breaker, non-automatic on overload but equipped with reverse-current mechanism, is mounted on the main switchboard. An electrically operated breaker, non-automatic on overload, equipped with reverse-power mechanism, is located on the floor beside the rotary, in the positive side in series with the hand-operated breaker on the switchboard. This arrangement provides a spare circuit-breaker and insures proper operation in case one of the reverse-power mechanisms should fail. The third, an electrically operated breaker, is provided for the negative connection and is mounted on the floor at the rotary on the same panel with a 2000-ampere electrically operated equalizer breaker. The closing current for each electrically operated breaker is handled at the breaker by a Westinghouse relay switch mounted on the same panel framework, above or below the breakers, as found convenient.

The same scheme is followed out with the 3000-kilowatt and the 1500-kilowatt rotaries, with Westinghouse breakers of corresponding capacities, wherever these machines are used in stations of the remote-control type.

The reverse-current devices on the hand-operated breakers are of the polarized mechanical-relay type which has proven more accurate and reliable than the solenoid type. As there is no necessity for electrical contact, these reverse-current devices are considered preferable to the separate form of electrical relay operating through shunt coils.



Electrically Operated 12,000-Ampere Circuit-Breaker With 2000-Ampere Equalizer Breaker at the Side.

Pyromagnetic Indicator to Facilitate Proper Hardening of Steel.

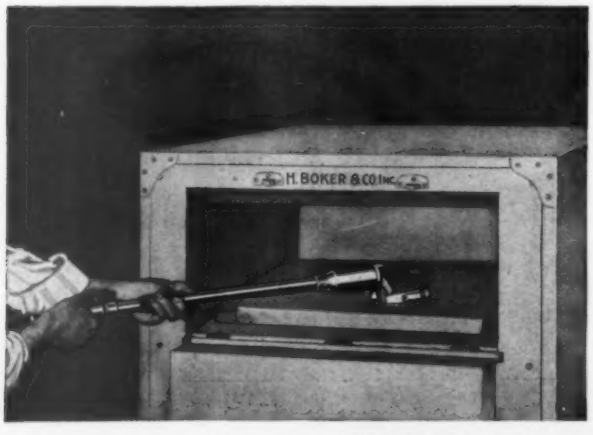
The great activity in all machine shops at the present time, which involves the use of countless tools that are made as a rule from special tool steel, makes it highly desirable to secure maximum efficiency in the

Pyromagnetic Indicator for Determining Proper Temperature in Heat Treatment of Steel.

necessary heat treatment of these tools. Many tools are spoiled or rendered relatively inefficient by being improperly hardened. For hardening steel in general or for other purposes than use in tools, it is equally important to secure minimum spoilage and perfect hardening in the shortest possible time. To facilitate proper hardening an instrument has been developed known as the "Pyromagnetic Indicator."

This instrument consists of a long tubular portion or handle with a push-button switch near one end. Secured to this end is a cord with a combination attachment plug and pilot lamp at the end. This is for enabling quick connection of the instrument to any standard 110-volt lighting circuit. At the far end, which is the indicating end of the instrument, there is inclosed a strong magnet coil at the end of which is pivoted an arc-shaped pole piece. A small non-magnetic rest is placed near the end. In using the instrument, this rest is placed upon or near the object being tested, so that the pivoted pole piece can freely swing into contact with it. If the object tested has magnetic properties, the pole piece, which is the magnetic needle of the instrument, will swing into contact with the object. If the latter has no magnetic properties the pole piece remains balanced.

The principle of operation of the instrument depends on the so-called decalescence of critical point reached in heating steel. If heat is applied to ordinary steel it increases in temperature steadily with each increment of heat up to a certain point. On further application of heat, instead of further increasing in sensible temperature, the heat is absorbed by the steel in certain molecular changes which last for a considerable period. This is the decalescence or critical point. Further application of heat causes the temperature again to increase regularly. At the critical point referred to the expansion of the steel is checked, and its magnetic qualities disappear, and at this point the steel develops the quality of becoming hardened if it is quenched. Steel quenched soon after reaching this critical point is in its best hardened state consistent with its strength, and its structure is invariably fine and dense, producing a tool of maximum capacity. From this it is evident that the loss of the magnetic property at the critical point can be made a reliable test of whether the steel has reached its proper temperature, and it is upon this fact that the instrument depends.



Using the Pyromagnetic Indicator to Test a Sample in Furnace.

In using the instrument as shown in one of the illustrations, the button is pushed in the handle, which causes the pilot lamp to light and show that the instrument is energized. The needle end is then placed into the furnace in such a position that the magnetic needle is brought into contact with the object to be tested. If the needle clings to the object the instrument is switched off and removed from the furnace. This indicates that the steel has not yet reached the proper temperature. The operation is then repeated at intervals until the needle refuses to cling or even be appreciably attracted by the object being tested, which shows that it is at its proper temperature and ready for quenching. It takes but a few seconds to make the test, and a number of parts or samples can be tested at the same time before removing the instrument from the furnace.

This instrument is manufactured by the Pyromagnetic Instrument Company, 175 North Jefferson Street, Chicago, Ill.

New Type of Electrically Driven Washing Machine.

A new type of washing machine recently developed by the Wayne Manufacturing Company, 100 to 124 Sydney Street, St. Louis, Mo., operates on the vacuum-cup principle. It is claimed that this type of washer cleanses the clothes thoroughly by alternately

New Vacuum-Cup-Type Electric Washer.

sucking and forcing the soapy water and air through the fabric while at the same time it will not injure the most delicate fabrics.

The vacuum cup of the Wayne washer is made of a one-piece steel stamping which is heavily galvanized. The sides are corrugated to give a rubbing action on the clothes on the downward stroke and also to strengthen the cup. The castings which support

the cup are also galvanized and attached by copper rivets.

The driving mechanism, which is mounted on the lid of the tub, causes the vacuum cup to oscillate as it moves up and down, thus changing the position of the clothes with each stroke. The mechanism is so controlled that lifting the lid automatically shuts off the washer.

The tub is made of carefully selected Louisiana red cypress which is thoroughly kiln-dried. The bottom is tongued and grooved and then glued. The inside and bottom are corrugated to help the agitation of the clothes and water. Three heavy steel hoops bind the tub together.

The platform frame is made of one-inch angle iron, braced with flat iron bars, all solidly riveted together. Wood strips are bolted on the frame to form the platform for the tubs. The wing or extra platform is detachable and when attached provides supports for two extra washing tubs and a clothes basket.

The wringer is so arranged that the wringing and washing operations can be carried on at the same time or separately. It is reversible and provided with a quick-releasing device so that in case any of the clothes should become wrapped about the rolls, the clothes can be removed without tearing by pressing the releasing lever. The wringer can also be swung as many different positions as may be desired to wring the clothes from one tub to another. The wringer is started and stopped by means of a small handle on the wringer which travels in the same direction as the wringer rolls. A central lever reverses the wringer or stops both the washer and wringer; thus the one lever gives complete control over the machine.

This washer is belt-driven by the special splash-proof washing-machine motor made by the Robbins & Myers Company.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

CABINETS AND CUTOUT BOXES, Sheet Metal.—General Electric Company, Schenectady, N. Y.

For inclosing fuses rated as follows: Cartridge fuses, 400 and 600 amperes, 250 volts. "G. E." Catalog Nos. GE 121-124 inclusive.

Listed June 5, 1917.

CONDUIT BOXES.—The Adapti Manufacturing Company, Cleveland, Ohio.

Service ell fittings of cast iron with sliding cover of pressed steel. "Adapti" Catalog Nos. 1100-1103 inclusive.

Listed May 21, 1917.

FIXTURES FOR USE WITH GAS-FILLED LAMPS.—L. Plaut & Company, 432 East 23d Street, New York, N. Y.

Listed June 1, 1917.

HANGERS, LAMP AND FIXTURE.—Benjamin Electric Manufacturing Company, 120-128 South Sangamon Street, Chicago, Ill.

Weatherproof suspension fittings for use with lamp clusters and reflector sockets on low-potential circuits. Catalog Nos. 6031-F, 6049-V.

Listed May 23, 1917.

METAL RACEWAY FOR SURFACE WIRING.—American Conduit Manufacturing Company, Keystone Building, Pittsburgh, Pa.

"Wiremold." Surface-wiring raceway for two-wire circuits not exceeding 1320 watts capacity.

Listed June 9, 1917.

METAL RACEWAY FITTINGS.—American Conduit Manufacturing Company, Keystone Building, Pittsburgh, Pa.

Fittings for use with "Wiremold" metal raceway.

Box connectors, catalog Nos. 581, 583. Bushing, catalog No. 502. Canopy rings, catalog Nos. 541-544 inclusive. Clip, catalog No. 503. Conduit couplings, catalog Nos. 582, 584. Corner box, catalog No. 519. Coupling, catalog No. 501. Crosses, tees and elbows, catalog Nos. 511-517 inclusive. Flush-switch plates, covers and adapters, catalog Nos. 551, 552, 553, 561, 562, 563, 571, 572, 573. Outlet boxes, catalog Nos. 532, 533, 537, 538; covers for same, catalog Nos. 531, 536. Rosettes, fuseless, catalog Nos. 521, 522, 523. Strap, catalog No. 504. Switch-box, catalog No. 550. Wood-molding coupling, catalog No. 588.

Listed June 9, 1917.

PORTABLE, FLEXIBLE CORD FOR ELECTRIC HEATERS.—D. & W. Fuse Company, Providence, R. I.

Marking—two black threads parallel with copper conductor, under cotton wrap.

Tag on coal to read: National Electrical Code Standard.

Listed May 29, 1917.

RECEPTACLES, Medium Base.—General Electric Company, Schenectady, N. Y.

"G.E." porcelain shell.

Key, 660 watts, 250 volts. Catalog Nos. GE570-575 inclusive.

Listed June 8, 1917.

SWITCHES, Surface. — General Electric Company, Schenectady, N. Y.

"G.E." Single-pole, catalog Nos. GE888-891 inclusive.

standard "G.E." pull-socket mechanisms. "G.E." single-pole, 1 ampere, 250 volts, 3 amperes, 125 volts, catalog Nos. GE656-657 inclusive.

Listed June 8, 1917.

RECEPTACLES, Candelabra and Miniature.—The Arrow Electric Company, Hartford, Conn.

"Arrow E" porcelain shell.

"Bull's Eye" lamp unit, catalog No. 1711.

Listed June 12, 1917.

SIGNS.—Broschart & Braun, Incorporated, 601-607 West 130th Street, New York, N. Y.

Electrically illuminated display signs for general use.

Listed June 12, 1917.

SWITCHES, Surface.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

"H. & H." single-pole, catalog No. 20½.

Listed June 1, 1917.

SOCKETS, Medium Base.—Best Electric Company, Harrison and 51st Streets, Pittsburgh, Pa.

"Best" weatherproof, composition shell. Catalog Nos. 1475-78 inclusive, 2250-53 inclusive.

Listed June 4, 1917.

SWITCHES, Fixture. — General Electric Company, Schenectady, N. Y.

Adaptations of standard "G. E." full-socket mechanisms.

"G.E." single-pole, 1 ampere, 250 volts, 3 amperes, 125 volts. Catalog No. GE655.

Listed June 8, 1917.

SWITCHES Pendent. — General Electric Company, Schenectady, N. Y.

Adaptations of standard "G.E." pull-socket mechanisms.

"G.E." single-pole, 1 ampere, 250 volts, 3 amperes, 125 volts, catalog No. GE654.

Listed June 8, 1917.

Activities in the Trade

The National Fibre Company, Yorklyn, Del., will build a new extension to its plant, covering an area about 60 by 105 feet.

The General Bakelite Company, Perth Amboy, N. J., will build a three-story addition to its local plant to cost about $20,000.

The Consolidated Electric Manufacturing Company, 223 North Thirteenth Street, Philadelphia, Pa., has ready for distribution its new catalog No. 3 on panel boards, steel boxes, safety switches, etc.

The Howard Miniature Lamp Company, Newark, N. J., manufacturer of incadescent lamps, has filed notice of organization to operate at 487 Orange street. Herbert E. Plass, 69 South Parkway, East Orange, heads the company.

Ideal Commutator Dresser Company, Hartford Building, Chicago, has issued a folder illustrating the "Ideal" composition tool used in keeping commutators in smooth, working condition. It is non-metallic, and can be applied while the machine is carrying its full load, without danger of short-circuiting the commutator bars or injuring its construction.

Youngstown Sheet & Tube Company, Youngstown, Ohio, took the lead in that city in the investment in Liberty bonds and in subscriptions to the Red Cross fund. The company took bonds to the amount of $3,000,000, and under an arrangement provided by the company the 12,000 employees invested $600,000. The Red Cross contributions of the company and its employees amounted to $160,000.

The Hunchman, issued monthly by the Ivanhoe-Regent Works of General Electric Company, Cleveland, Ohio, presents in its July number some excellent illustrations, one of which is that of the Ivanhoe Reflecto-Cap-Diffuser, described in a recent number of ELECTRICAL REVIEW. This diffuser is adapted to the use of industrial plants where high-intensity light is required, and where it must be maintained without glare. It is used with the 200-watt mazda lamps. The new Holophane display window reflectors are also illustrated and described.

The L. B. Stillwell Engineering Corporation, 100 Broadway, New York City, has been organized with the following as officers: Lewis B. Stillwell, president; H. St. Clair Putnam, vice-president and general manager; Hugh Hazelton, vice-president; W. Everitt Rundle, secretary and treasurer. The corporation purposes acting as construction engineers, in designing and building steam and hydroelectric, lighting, railway and power plants, electric transmission lines, the electrification of railroads, the design and construction of steel rolling stock, railroad terminals, heating plants, and general engineering construction.

Underwriters' Laboratories' Motion-Pictures Used in Raising Red Cross Funds.—Last spring Underwriters' Laboratories, Chicago, Ill., had made a new fire-protection motion-picture which was intended to be loaned to insurance men, public officials and others for use in educational campaigns. The picture, which is a two-reel subject entitled "An Unbeliever Convinced," has been so well received that fire chiefs who have seen it have asked to be allowed to feature this film on certain days in theaters where admission is charged, and to contribute the funds thus obtained to the local chapter of the Red Cross. It is planned to put this system into operation within the next few days.

The Lincoln Electric Company, Cleveland, Ohio, manufacturer of polyphase motors, arc-welding machines and battery-charging plants, announces the opening of an office at 10 High Street, Boston, Mass., under direction of W. A. Blatchford. This company recently issued a valuable booklet on arc welding, as applied to steel foundries, street car lines, ship and marine work, locomotive shops, automobile and drop-forging plants and general shop work. In this age, when all industries must reach the maximum of efficiency, when material must be conserved and work speeded up, the arc-welding equipment becomes the source of time-saving and a great many other economies. The Lincoln Electric Company's welding sets are compact and practically self-regulating, thus making them very convenient as well as efficient in operation.

The J. G. White Engineering Corporation, New York City, has been awarded a contract to build a research laboratory on Langley Field, near Hampton, Va., by the National Advisory Committee for Aeronautics. This laboratory is to be for the usual structural tests on aeroplanes and aeroplane parts; also for scientific research pertaining to aeronautics. Instruments are being designed for use on aeroplanes in measuring the thrust developed by the propeller, the power consumed and the revolutions, and others to indicate the attitude of the plane in relation to the horizontal. A wind tunnel of the Eiffel type is to be built for tests on aeroplanes. The laboratory will contain complete machine, instrument and pattern shops.

Kilbourne & Clarke Manufacturing Company, Seattle, Wash., manufacturers of wireless apparatus, has been given a contract by the United States Navy Department for the construction and delivery within nine months of 250 additional radio transmission telegraph sets, at $988,000, which with the other contracts from the Government held by the company makes a total of 315 sets, at a cost of $1,112,000. The contract for the additional sets was closed at Washington recently through Frederick G. Simpson, vice-president and general manager of the company. The contract calls for 200 one-kilowatt and 50 two-kilowatt transmission sets for the use of the Navy Department. It is understood some of these are to be installed on naval vessels while probably the most of the order will be for equipping the vessels of the United States Shipping Board Emergency Fleet. The local organization has not been definitely instructed on this point. In the execution of this contract the local plant is to be run with three shifts requiring 200 additional men. Radio experts under supervision of R. H. Marriott, expert radio aide at the Bremerton navy yard, will direct the work of getting out this large order and will be assigned to the job as inspectors. As fast as the radio sets are completed they will be delivered to the naval officials at Bremerton and will be distributed from that point. Each set is to be equipped, ready for installation on board any craft or station that may be selected by the Government. Work of filling the order is to be rushed. Coincident with the placing of the large order with the Government word was received by this concern that it had been granted patent rights for Great Britain and France for its type of radio apparatus and component parts. The company will shortly submit quotations to the government of Russia involving large contracts. It is recalled that this concern some time ago fought to a successful issue in the Federal courts the claim of the Marconi company that it was infringing certain patents.

Personal and Biographical

GEORGE A. LEWIS, consulting electrical and structural engineer, Auburn, N. Y., has received a captain's commission in the Sixth Regiment of United States Reserve Engineers, mobilizing at Detroit, Mich.

O. F. DUBRUIEL, who for some years has been with the St. Cloud Public Service Company of St. Cloud, Minn., has resigned to enter the service of the Pan Motor Company, St. Cloud, as electrical engineer.

H. C. CARROLL has resigned his position as chief engineer of the Muncie Electric Light Company, of Muncie, Ind., and associated himself with the Indianapolis Light & Heat Company, of Indianapolis, Ind.

ALBERT HARRIS, who has been manager of the lighting utility company at LaGrange, Ky., has been appointed manager for the LaGrange district by the Kentucky Utilities Company, which recently took over the property.

DONALD MCDONALD, vice-president and general manager of the Louisville Gas & Electric Company, has been appointed chairman of one of the civilian exemption boards, which will pass on the exemption claims of Louisville men subject to the draft.

T. LINDSEY FITCH, vice-president of the Kentucky Public Service Company, Bowling Green, Ky., has offered his services to the government as interpreter in France. Mr. Fitch, 46 years of age, has frequently been in France and lived there for a year.

LAMAR LYNDON, consulting engineer, 17-21 Park Row, New York, now has associated with him Frank S. Taylor, formerly resident engineer on the Austin dam construction. With this acquisition, the firm name of Lyndon & Taylor appears at the location noted above.

D. B. MUGAN, formerly associated with the Illinois Central Railroad Company, in charge of the electrical department at New Orleans, La., has been appointed resident manager of the Edison Storage Battery Supply Company, with headquarters at 201 Baronne Street, New Orleans. The South is full of promise for considerable development in both the sale of commercial street trucks and the sale of storage-battery industrial trucks and storage-battery tractors. The popularity of Mr. Mugan's appointment breathes a confidence that this section of the country will be developed as never before.

H. D. SHUTE, whose election as vice-president of the Westinghouse Electric & Manufacturing Company was announced in our issue of June 30, will have executive charge of the company's commercial organization, both domestic and export, succeeding Vice-President L. A. Osborne, whose headquarters have been transferred to New York.

E. M. PLUMMER, who for some years has been chief engineer of the Atlantic City Electric Company, Atlantic City, N. J., has been appointed chief engineer of the new power station of the American Gas & Electric Company at Windsor, W. Va. This fine new plant is now under construction; its general features were described in our issue of May 25.

W. B. MISER, formerly with the Illinois Traction System at Jacksonville, Ill., has been appointed manager of the Drumright Light & Power Company, at Drumright, Okla., one of the new properties recently acquired by H. M. Byllesby & Company, and which will be part of the enlarged Oklahoma Gas & Electric Company.

T. G. WHALING, who has been assistant general manager and sales manager of the Westinghouse Lamp Company, has been appointed general manager. Mr. Whaling will continue to exercise the functions of sales manager and in addition assume duties of an executive nature in connection with the administration of the affairs of the Westinghouse Lamp Company.

W. P. SIDLEY, vice-president of Western Electric Company, Incorporated, and for a number of years president of the Chicago Y. M. C. A., as a member of the National War Council of the Y. M. C. A. of the United States, has been put in charge of the concentration camps of that organization's central department, including fifteen states lying north of the Ohio river and between Pennsylvania and Colorado, inclusive.

HENRY L. DOHERTY, president of the Society for Electrical Development, and reigning Jupiter of the Jovian Order, has taken a residence at Bridge and Broad streets, New York City, in one of the oldest of Manhattan buildings, having completely remodeled and electrically equipped the second floor of that building to suit his conveniences and tastes. Mr. Doherty chose this location partly on account of its nearness to his business office.

GRESHAM THOMAS recently resigned as chief clerk of the purchasing department of the Georgia Railway & Power Company, Atlanta, to become buyer for the Mill Power Supply Company, with headquarters at Charlotte, N. C. Mr. Thomas, who assumed his new position July 1, spent 17 years with his former employers, advancing from each position to the one next higher. His new position is one of especially important responsibility.

ARTHUR B. LISLE of Providence, R. I., has been elected president of the New England Section, National Electric Light Association. Mr. Lisle has been connected with the Narragansett Electric Lighting Company, of Providence, since 1893, being advanced to various positions from time to time and since 1908 has been general manager of the company. He is also interested in other utility companies, being treasurer of the Putnam (Conn.) Light & Power Company, and president and treasurer of the Central Connecticut Power & Light Company. He has been a very active member of the New England Section, N. E. L. A., for many years, has served on its executive committee and as its vice-president.

HENRY FREDERIC FRASSE, who for the past 12 years has been purchasing agent of the Edison Electric Illuminating Company of Brooklyn, was recently presented with a gold watch fob by the members of the purchasing department Good Fellowship Club, as a token of their high esteem and appreciation of the benefits resulting from club activities. William Bodkin, chairman of the Good Fellowship Club, made the presentation at a little informal luncheon. The Good Fellowship Club has created wide comment in and out of the electrical industry and many large corporations have written Mr. Frasse for details of the club in order to inaugurate similar welfare plans for their own employees. That the members have benefited through following the plans recommended and urged by Mr. Frasse is confirmed by the efficient work in the department which cumulatively has had an influence in producing better work throughout the company. As a speaker at one of the semi-monthly meetings remarked: "A public service corporation with a body of employees working under such favorable circumstances must, in the fullest sense, convey the best of service to the public at large."

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

WORCESTER, MASS.—New England Power Company, it is reported, will spend $7,000,000 on plant extensions. A hydro-electric station of 22,000-kilowatts capacity probably will be built in upper Deerfield valley, Vermont, it being possible to secure about 300 feet operating head at that site.

HARTFORD, CONN.—Application for permit to consolidate the United Electric Light & Power Company, Housatonic Power Company, Seymour Electric Light Company and Rocky River Power Company was heard by Public Utilities Commission on July 12. Under the proposed consolidation the Rocky River Power Company is to pay $6,000,000 cash for the interests of the other companies. It is believed the consolidated company will construct other hydroelectric plants on the Housatonic, and a steam-electric central station at some location on tidewater.

SYRACUSE, N. Y.—The Syracuse Lighting Company is arranging to furnish power and lighting service at the new military camp on Van Vleck Road. The company will extend its transmission system to the site; a local lighting system will be installed at the camp. The work is estimated to cost $20,000.

BAYONNE, N. J.—The National Sulphur Company has entered into agreement with the Public Service Electric Company to furnish power for its plant in the Hook section. The company will install an underground conduit system from Twenty-second Street to the works for the service.

GLOUCESTER CITY, N. J.—The Delaware & Atlantic Telegraph & Telephone Company has made application for a fifty-year franchise for the installation of underground and overhead lines in streets of the city.

JERSEY CITY, N. J.—The Board of Public Utility Commissioners has granted permission to the New York Telephone to construct and operate lines in North Bergen.

NEWARK, N. J.—The Tanners' Leather Company will construct a one-story power house addition to its plant at 390 Frelinghuysen Avenue.

NEWARK, N. J.—The Common Council is planning for the installation of a new lighting system in Center Market. Bids for the work will be asked at once.

NEWARK, N. J.—A one-story power house will be constructed by the Alcohol Products Company at its new plant at Blanchard Street and the Passaic River. The structure will cost $13,500. The entire plant will cost about $75,000.

NEWARK, N. J.—The Public Service Electric Company will install a new street-lighting system in Coe Avenue, Hillside.

NEWTON, N. J.—The Borough Committee is planning for the installation of an electric street-lighting system to replace the present gasoline lamps. Negotiations for the improvement are under way with the Newton Gas & Electric Company.

PATERSON, N. J.—To conserve the supply of electric energy available, the Public Service Company is making a local survey for data covering electric street signs, with view of eliminating those which are not deemed necessary.

PERTH AMBOY, N. J.—The Board of Aldermen has sold a bond issue of $50,000 for the construction of a distributing system for the municipal electric station.

STRATFORD, N. J.—The Lighting Commission of the Township Committee is planning for the rebuilding, improvement and extension of the local street-lighting system. It is planned to award a five-year lighting contract in connection with the work.

THOROFARE, N. J.—The Improvement Association has succeeded in inducing the local lighting company to install more and better street lights in the town.

TRENTON, N. J.—The Board of Public Utility Commissioners has granted the Eureka Power Company permission to construct and operate new lines in different sections of the county. The company will build a new line along the River Road, between Hopewell and Ewing Townships; lines will also be constructed from Washington's Crossing to Titusville and Pennington. The New Jersey & Pennsylvania operates this company.

GREENVILLE, PA.—The County Commissioners are figuring on a site for the erection of a new power house and heating plant, which will be built as soon as site is secured.

LANCASTER, PA.—Directors of the Lancaster General Hospital are planning for the installation of a new electric power station for lighting and other service at the institution to cost about $15,000.

PHILADELPHIA, PA.—The Department of Public Works is having plans prepared for a new one-story, brick and steel power plant to be erected at Thirty-fourth and Pine Streets. Philip H. Johnson is architect.

PHILADELPHIA, PA.—The Philadelphia Rubber Works Company will build a new one-story transformer station at its plant at Thirty-seventh and Reed Streets.

PHILADELPHIA, PA.—The Philadelphia & Suburban Gas & Electric Company is negotiating with the Borough Council of North Wales for a contract for street-lighting service.

LAUREL, DEL.—The Diamond State Telephone Company will build a new line from Cape Delaware to Cape Charles, Va.

NEWCASTLE, DEL.—The Diamond State Telephone Company has made application to the Council for the installation of new cable lines in the business district, replacing present single strand wires.

ANNAPOLIS JUNCTION, MD.—The Quartermaster-General's Department, Washington, D. C., is planning for the installation of an electric lighting system at the new training camp to be established in this vicinity.

BALTIMORE, MD.—The Black & Decker Manufacturing Company, manufacturer of electric drills, air compressors and similar specialties, will build a power house at its new plant to be erected at Towson, Md. The company has acquired a tract of about 40 acres for its proposed works. H. F. Doeleman, American Building, is engineer.

BALTIMORE, MD.—The city has taken bids for 600,000 feet of vitrified clay conduits for the electrical department. The new conduits will be used for extensions in the present underground system. Raleigh C. Thomas is chief engineer.

NORFOLK, VA.—The Bureau of Yards and Docks, Washington, D. C. (F. R. Harris, chief) will receive bids up to July 23 for two coal-handling plants at Norfolk and Philadelphia, Pa.

BURNSVILLE, W. VA.—The Pittsburg & West Virginia Company, operating oil and coal properties, will increase the capacity of its local pumping plant, including the installation of new engines, boilers and other equipment. The company also plans to extend other plants of its system.

FAIRMONT, W. VA.—The Monongahela Valley Traction Company is planning for the construction of about thirty miles of new transmission lines to Rosemont, Galloway and other districts to furnish electric power for coal mining operations.

HARTLAND, W. VA.—The Hartland Power Company will soon commence construction work on a new transmission line from its power station at Hartland, to Dorfee, a distance of about four miles. This will be a 13,200-volt line and will serve coal operations in the vicinity of Dorfee. A contract has already been signed with the Thompson Block Coal Company and it is expected that two other contracts will be signed within thirty days.

NEW BERN, N. C.—The Home Telephone & Telegraph Company will establish a new two-story exchange and operating plant.

SPENCER, N. C.—The Southern Railway will operate its new local car repair shops by electric power, with individual motor drive where required. A transformer station will be constructed at the works.

WARSAW, N. C.—City officials have arranged for a bond issue of $15,000 to be used for electric lighting work.

NORTH CENTRAL STATES.

ANTWERP, O.—The Northwestern Ohio Light & Power Company has been given a franchise for lighting the streets of this town.

BRATENAHL, O.—Sealed bids will be received at the office of the Clerk of the Village of Bratenahl, at 413 East 105th Street, Cleveland, July 28, for constructing and erecting a police telegraph signal system. Address C. A. Neff, clerk.

CINCINNATI, O.—The property of Cincinnati, Dayton & Toledo Traction Company has been bought at receiver's sale by the Bondholders' Protective Committee at $400,000. The property is appraised at $2,900,000. The purchasing committee represents $2,500,000 of the $2,700,000 consolidated mortgage. The committee comprises James M. Hutton, Otto Armleder, Leo. J. Van Lahr, Edgar Friedlander and Claude Ashbrook. It is reported that the committee will negotiate with the Ohio Electric Railway Company to arrange for operating the road. This road extends from Cincinnati to Dayton, with a branch from Miamisburg to Germantown.

COLUMBIA, O.—It is proposed to expend $65,000 in establishing a new lighting system. Address Herman Gamper, engineer, who has prepared plans.

LORAIN, O.—Black River Telephone Company is installing automatic switchboard equipment in its new exchange building.

MASSILLON, O.—The Massillon Electric & Gas Company, a subsidiary of the Cities Service Company, has closed a 14,000-kilowatt contract with the Central Steel Company of Massillon. The contract calls for delivery of 6,000 kilowatts by August 1 and the remaining 8,000 kilowatts by January 1, 1918. Other customers will take 4,000 kilowatts additional in the next six months. An additional 4,500-kilowatt unit is being added to the utility's plant.

MIDDLETOWN, O.—Office of Middletown Telephone Company is being provided with new equipment, to make use of the automatic ringing and flash recall system. Installations are being made by Western Electric Company.

REPUBLIC, O.—Republic village council has awarded to Charles L. Zahm, Detroit, the contract for erecting four miles of electric light wire from the Ohio Light & Power Company, Tiffin-Shelby line, and wiring the city for street lights. The contract price is $10,560.

YOUNGSTOWN, O.—The Mahoning & Shenango Railway & Light Company, operating with capital of $21,000,000, has arranged for the acquisition of the Youngstown & Sharon Railway, the Mahoning Valley Southeastern Railway, the Mahoning Valley Railway, the Youngstown Falls & Park Railway, and the Polan Railway. The different properties will be merged with its present system.

INDIANAPOLIS, IND.—The Marion

County Board of Commissioners is calling for bids for the reconstruction of the power house at the Marion County Asylum for the Insane at Julietta, which was recently destroyed by fire. Leo. K. Fosler, county auditor.

NOBLESVILLE, IND.—The Noblesville Heat, Light & Power Company, the Noblesville Water Company, the Noblesville Gas Company and the Home Telephone Company have surrendered their franchises in this city and will operate under indeterminate permits, issued by the Public Service Commission. The City Council refused to recognize the surrender of the franchise held by the telephone company on the ground that it had been operating in the city for eighteen years without a franchise.

ROCHESTER, IND.—The United Public Service Company of Indianapolis will install two electric pumps of sixty pounds pressure in the city water works. The new machinery will cost the city $4,000.

RUSHVILLE, IND.—The Modern Appliance Company, which was moved here from Chicago, has received a contract from the Western Electric Company for 1,000 telephone brackets each month. The company has established an agency in Canada and has entered into a contract with the Kellogg Switchboard & Supply Company to make brackets.

SOUTH BEND, IND.—The Indiana & Michigan Electric Company has asked permission to issue $300,000 worth of bonds to cover construction work at their various plants.

WARSAW, IND.—The Syracuse Power & Light Company, which for a number of years has been controlled by the Warsaw Investment Company, has been sold to the Hawks Electric Company of Goshen for $70,000. The plant supplies light and power for Syracuse, Milford, Benton, Lake Wawasee and other northern Indiana points.

FREEPORT, ILL.—The Rockford & Interurban Railroad Company, Rockford, contemplates building a station and extending a loop around this city.

LANARD, ILL.—$900 has been subscribed by the citizens for the installation of boulevard lights. About $1,200 will be necessary.

LINCOLN, ILL.—Bonds in amount of $30,000 were voted recently to purchase and re-equip the street car system.

LINCOLN, ILL.—The Lincoln Water & Light Company has been sold to persons now operating the Logan County Gas Company of this city. It is planned to enlarge the plant and to extend the services in Lincoln and contiguous counties. E. MacDonald, manager.

WAUKEGAN, ILL.—A deal is about to be consummated whereby the Wauconda & Palatine Electric Railroad will be taken over by western capitalists and an electric line from Evanston to Lake Geneva, Wis., will be built.

ESCANABA, MICH.—City has renewed its contract with Escanaba Traction Company to supply power to operate municipal lighting plant for period of ten years.

GRAND LEDGE, MICH.—$175,000 is to be expended to extend the electric railway from Lansing to Grand Ledge, Mich.

GRAND RAPIDS, MICH.—The Eastern Michigan Power Company plans the construction of $20,000 building on the west side canal. Several thousand dollars' worth of machinery will be purchased.

LOWELL, MICH.—The Lowell village municipal electric lighting plant which was recently destroyed will be rebuilt.

BEAVER DAM, WIS.—Mayor Mirlach is advocating municipal ownership of the electric light plant, alleging inability to secure from the Wisconsin Power, Light & Heat Company a fair rate for lighting the white way. The company replies that its rate is below that determined as fair by the State Railroad Commission, and offers to go over the entire question again with the city.

MADISON, WIS.—Mead & Seastone, engineers, of Madison, have prepared plans for the erection of a hydroelectric plant for the Pennsylvania Power Company, to cost $500,000.

MILWAUKEE, WIS.—Rumors that the Milwaukee Northern Railway Company is to be taken over by the Milwaukee Electric Railway & Light Company have been in circulation at Cedarburg, where offices of the Northern line are located, for some time. The reports are denied by both F. W. Walker, superintendent of the Milwaukee Northern, and by R. B. Stearns, vice president and assistant general manager of the Electric Company.

DATES AHEAD.

International Association of Municipal Electricians. Annual convention, Niagara Falls, N. Y., September 11 to 14. Secretary, Clarence R. George, Houston, Texas.

Northwest Section, National Electric Light Association. Annual convention, Spokane, Wash., September 12 to 15. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

American Electrochemical Society. Annual convention, Pittsburgh, Pa., October 3 to 6. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

National Electrical Contractors' Association of the United States. Annual convention, New Orleans, La., October 10 to 13. Secretary, H. C. Brown, Utica, N. Y.

MILWAUKEE, WIS.—The Wisconsin Valley Electric Company has given the Wisconsin Valley Trust Company a deed in trust on all the property it now owns or may hereafter acquire in Marathon, Portage and Lincoln counties, Wisconsin, for the sum of $15,000,000. A portion of the money will be used to retire outstanding bonds. The issue means that the company, which owns many waterpowers on the Wisconsin River, street railroad lines at Wausau, Merrill, Schofield and Rothschilds, Wis., as well as other property and a valuable franchise, expects to materially increase its holdings and make many improvements, including new dams and larger plants.

SUPERIOR, WIS.—The Great Northern Railway Company has awarded to Westinghouse, Church, Kerr & Company, New York and Chicago, a contract to build a new power house, at a cost of $35,000.

MINNEAPOLIS, MINN.—An addition to the Highland Exchange of the Northwestern Telephone Exchange will be constructed at Lyndale and 21st Street, to cost $62,000.

BURLINGTON, IA.—The Peoples' Gas & Electric Company has secured two new franchises for lighting at Deep River and Thornburg, Iowa. A new plant is to be erected at Thornburg. This company has asked for permission to cross the public highways in constructing a transmission line from Burlington to Middletown.

DES MOINES, IA.—The Des Moines City Railway Company has been asked by superintendent of streets to rush work on extension of line on University Avenue.

DOW CITY, IA.—The franchise for constructing a telephone system has been awarded to the Wright and Franklin County Telephone Company.

SIOUX CITY, IOWA.—In order to economize in coal and copper and to provide capacity for a rapidly increasing demand, the Sioux City Service Company has made a careful study of its power-plant conditions and electrical distribution system. Fred A. Krehbiel and Edward N. Lake, of the Krehbiel Company, Chicago, have co-operated with the company's engineers in making detailed tests and reports. Following the recommendations of the engineers, extensive improvements will be made at once in the power plant and in the distributing system.

CANTON, MO.—Election to vote bonds amounting to $10,000 for electric light and water improvements carried.

KANSAS CITY, MO.—The Southwestern Bell Telephone Company has purchased three lots at 39th and Walnut Streets, where it will erect a large building.

ATWOOD, KANS.—The election to vote $20,000 in bonds to improve the electric light plant carried. A larger engine and dynamo will be purchased at once and some of the electric lines extended.

BAXTER SPRINGS, KANS.—The Southwest Missouri Railroad Company, now building an electric line from Galena to this city, will extend its line to Oklahoma City.

CHEROKEE, KANS.—The Kansas Gas & Electric Company, owning plants at Cherryvale, Independence, Cherokee, Pittsburg and other towns in Kansas, will build a high-tension line between Cherokee and Cherryvale. The County Commissioners have been asked for permission to build a line from Cherryvale to the Labette County line. The towns of Mound Valley and Altamont have made application to the company to be served.

CHERRYVALE, KANS.—P. Hemphill and H. L. Gary, of Kansas City, and W. E. A. Nottorf, of Lawrence, today purchased the Cherryvale Telephone Company exchange from Judge G. S. Hoss of this city. Mr. Hoss, who has been president and manager of the exchange for thirteen years, retains an interest in the company and will be one of the directors. Officers of the new concern are: W. P. Hemphill, president; H. L. Gary, vice president; W. E. A. Nottorf, secretary. Mr. Hemphill is also president of the Kansas Telephone Company, and operates an exchange at Ottawa and Lawrence. Mr. Gary operates telephone properties in Missouri, Kansas and Texas.

CLEARWATER, KANS.—Bids will be advertised in the near future for waterworks improvements, including generator, oil engine and pump. Frank Murphy, clerk.

ENSIGN, KANS.—The Ensign Telephone Company has been incorporated at $10,000 by L. O. Sutton, G. H. Culver and J. E. Stahr, all of Ensign.

FULTON, KANS.—The ordinance granting the Pleasanton Electric Power Company a twenty-year franchise was passed.

GOODLAND, KANS.—The United Telephone Company has purchased the long-distance line between Goodland and Colby. A new toll line is to be built between Goodland and St. Francis.

GREAT BEND, KANS.—A new long-distance telephone line will be built along the Santa Fe and Missouri Pacific from Great Bend to Denver.

HAYS CITY, KANS.—Bids will be called for soon on electrical and water works improvements to the amount of $50,000. Address E. T. Archer & Company, New England building, Kansas City, Mo., or W. N. Chittenden, mayor.

PAOLA, KANS.—Election will be held in the near future to vote on granting a new franchise to the Paola Electric Company.

PARTRIDGE, KANS.—Electric light and power will be installed here the coming year.

SALINA, KANS.—A proposition by the Salina Light, Power & Gas Company is for the removal of the arc lamps and the substitution of a white way. The work is to be completed in three years by removing one-third of the lamps each year, should the plans be finished, as seems probable.

TOPEKA, KANS.—The Chamber of Commerce is planning to have a new car line built by the Street Railway Company from Gage Park to the new Knight of Security hospital.

WICHITA, KANS.—The Kansas Gas & Electric Company recently appointed W. A. Wadsworth, of Cincinnati, O., district manager for Wichita, under L. O. Ripley, vice-president and general manager of the company. The board also passed on $1,000,000 worth of expenditures for Kansas, about half of which will be spent in the Wichita district.

BEATRICE, NEB.—The building of a $50,000 electric light plant is under consideration by the commissioners.

BEAVER CITY, NEB.—Election to vote $10,000 in bonds for improvement of the water and light plants and installation of twenty-four-hour service, carried.

GREELEY, NEB.—A bond issue of $13,000 was voted, the proceeds of which are to be used in providing Greeley with a municipal light and power plant.

LINCOLN, NEB.—The Meyer Hydro-Electric Power Company has been authorized to issue common stock to the amount of $50,000 by the State Railway Commission. The proceeds are to be used in reimbursing the promoters for money spent in installing a plant near Oak, Neb.

PETERSBURG, NEB.—The business men made a special effort to secure funds to insure an electric light plant for the city. Many farmers came to their aid by subscribing. Work will begin at once on the distribution system. The Community Club, through its committee, J. J. Andre, Ed O'Shea and J. J. Carey, is back of the project.

BOWBELLS, N. D.—Bowbells electric light plant has been sold by McIntire & Swanson to the Public Utilities Corporation, which took charge of the plant

July 1. The company is contemplating putting on a twenty-four-hour service and other improvements.

WASHBURN, N. D.—The McLean County Farmers' Telephone Company will build a 100-mile telephone line, to cost $10,050. Address general manager.

SOUTH CENTRAL STATES.

HELLIER, KY.—The Greenough Coal Company is planning for the installation of new electric equipment for the operation of its local properties. Thomas J. Mitchell, Uniontown, Pa., is one of the heads of the company.

LOUISVILLE, KY.—The Louisville Gas & Electric Company is planning for the extension of its system to the new military cantonment to be established near the city.

Owingsville, Ky.—James M. Richards and E. V. Brother have taken over the Owingsville electric light plant, the contract of the old owners having expired. It is stated that the owners will erect a new plant and install new equipment, the power to be a 75-horsepower oil engine.

WHITESBURG, KY.—The Caudill Coal Company, recently organized, is planning for the installation of electric equipment at its properties. M. J. Moss is president.

CHATTANOOGA, TENN.—The Southern Ferroalloys Company, Chattanooga, has been recently organized to establish a local plant for the production of various alloys. The company plans for the operation of three electric furnaces. The plant will be electrically operated throughout, with power furnished by the Chattanooga Tennessee River Power Company.

KINGSPORT, TENN.—The Kingsport Utilities Company, recently incorporated with a capital of $1,000,000, is planning for the construction of a power plant, with transmission system and distributing lines to reach to neighboring sections. Sherwood C. Hall is president of the company.

PRESSMAN'S HOME, TENN.—Clinchfield Hydro-Electric Power Company, Pressmen's Home, Tenn. Capital stock, $50,000. Incorporators: John A. Thompson, E. K. Baldwin, M. P. Beasley, L. D. Carmack, C. D. Jarvis. To develop water power on rivers and streams.

BIRMINGHAM, ALA.—The Alabama Power Company will soon commence the operation of its new steam generating plant on Baker's Creek, about twenty-five miles from Birmingham. The station will have an initial capacity of 25,000 kilowatts which will be increased later to 75,000 kilowatts. The company is also building an extension to its hydro-electric plant on the Coosa River to provide for a total output of about 90,000 horsepower.

ARDMORE, OKLA.—The Plains Oil & Gas Company, having permits to do business in Texas, has increased its capital stock from $100,000 to $500,000 for the purpose of extending operations.

SENTINEL, OKLA.—Election will be held soon to vote on bonds to the amount of $15,000 for sewers and electrical improvements.

STILLWATER, OKLA.—Election will be held soon to vote $6,000 in bonds for installation of a boiler and other additional equipment for the electric light and water plants.

BEAUMONT, TEX.—Bids were received up to July 10 by the Southwestern Telegraph & Telephone Company to construct a building at Main Street and Liberty Avenue, at a cost of $150,000 to $200,000. The contract will be let in Houston, Tex.

STOCKDALE, TEX.—A movement is on foot to establish an electric light plant.

WESTERN STATES.

SANTA FE, N. M.—The Rio Grande Light, Heat & Power Company has filed a deed of trust with the County Clerk at Albuquerque for $3,000,000, pledging its franchise and properties to the Fairmont Savings Trust Company, of Philadelphia, the money to be used for the White Rock canyon project.

THATCHER, ARIZ.—An election will be held July 30 to determine whether the town shall be bonded for $18,000, said money to be used for installing a municipal electric lighting plant and an ice plant.

WILLIAMS, ARIZ.—The power house of the Williams Water & Electric Company burned recently; the loss is estimated at about $100,000.

TONOPAH, NEV.—Work has begun on the construction of a power station for the Great Western and Tonopah Bonanza mines, to furnish power for operating the mining and milling machinery.

YERRINGTON, NEV.—The Kennedy Consolidated Mines Company is preparing to install an electric lighting plant on its property.

GRANGEVILLE, IDA.—E. W. Kramer of Missoula, Montana, hydroelectric engineer of the U. S. Forestry Service, recently inspected and passed on the site of the intended $85,000 dam which the Grangeville Electric Light & Power Company plans to install this summer.

GUFFEY, IDA.—Recent reports indicate that the Idaho Power Company will install six new units at Swan Falls plant, on the Snake River, near Guffey, this work to begin during the summer and cost about $500,000.

LEWISTON, IDA.—Council has approved plan for installation of ornamental lights on Main Street from Lewiston-Clarkston interstate bridge to the Union depot.

COLVILLE, WASH.—The Pioneer Telephone Company has petitioned the County Commissioners for a franchise to use a portion of the Joe Martin road for the construction of a telephone line.

EVERETT, WASH.—The Washington Coast Utilities, Inc., has applied for a franchise for a telephone system in this county.

PALMDALE, CAL.—The Southern California Edison Company will extend its wires from Lancaster into Palmdale and Little Rock.

SACRAMENTO, CAL.—E. W. Book has been awarded the contract for the erection of a freight wharf and shed which the Northern Electric Company is to build in this city.

RIVERSIDE, CAL.—The Board of Supervisors has voted to advertise for bids on new electric wiring in the court house.

SAN BERNARDINO, CAL.—This city is to be the district headquarters of the Southern California Edison Company, which recently absorbed the Pacific Light & Power Corporation.

SAN DIEGO, CAL.—An ordinance has been adopted granting the San Diego Electric Railway Company a franchise to operate a railway in San Diego.

SAN FRANCISCO, CAL.—Geo. S. De Sousa, traffic manager of the Marconi Telegraph Company, has transferred his headquarters to this city, where he will be in charge of the entire Pacific Coast division of the Marconi Company.

SAN FRANCISCO, CAL.—Creditors of the Gas & Electric Appliance Company have filed an involuntary petition in bankruptcy against the concern. It is charged that the company owes debts in excess of $10,000.

SAN FRANCISCO, CAL.—The contract for lighting fixtures in Engine House No. 37 has been awarded to Thos. Day Company at $1,205, and the contract for electric wiring of the same building has been awarded to T. J. Bennett at $1,748.

FINANCIAL NOTES

Each succeeding week brings an increase of orders to General Electric Company over the amount received in 1916 when the total reached $167,169,058, or 70 per cent greater than orders for 1915 and 50 per cent greater than orders for the largest previous year, 1913. At the present rate, orders for the year should reach $230,000,000, or approximately 37 per cent greater than 1916. Great foresight and business acumen were displayed by the management of this company in 1916, when it increased inventories by $21,297,349, making a total of merchandise inventories on hand December 31, 1916, of $51,160,639. This item is carried at a value to protect it against possible depreciation. But as raw material and merchandise of all kinds have increased in value, the asset value of the inventories of this company has likewise increased and proved to be a much better asset than cash. In 1916, after expending $8,828,254 for plant account and writing it off against income, the company earned 18.3 per cent on its capital

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRIC COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate per cent.	Bid July 3.	Bid July 10.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	..	13	13
Adirondack Electric Power of Glens Falls, preferred	6	73½	73
American Gas & Electric of New York, common	10+extra	116	118
American Gas & Electric of New York, preferred	6	48	48
American Light & Traction of New York, common	..	319	316
American Light & Traction of New York, preferred	6	109	109
American Power & Light of New York, common	4	67	67½
American Power & Light of New York, preferred	6	87	87½
American Public Utilities of Grand Rapids, common	..	28	28
American Public Utilities of Grand Rapids, preferred	6	64	64
American Telephone & Telegraph of New York	..	120⅛	120⅝
American Water Works & Elec. of New York, common	..	8	8
American Water Works & Elec. of New York, particip.	7	23	22
American Water Works & Elec. of New York, first preferred	..	76	77½
Appalachian Power of Bluefield, common	..	5	5
Appalachian Power of Bluefield, preferred	7	30	30
Cities Service of New York, common	6+extra	277	275
Cities Service of New York, preferred	6	85	85
Commonwealth Edison of Chicago	8	122	123
Comm. Power, Railway & Light of Jackson, common	4	47	49
Comm. Power, Railway & Light of Jackson, preferred	6	75	76
Federal Light & Traction of New York, common	..	11½	11
Federal Light & Traction of New York, preferred	..	43	43
Illinois Northern Utilities of Dixon	6	78	78
Middle West Utilities of Chicago, common	2+2 extra	40	54
Middle West Utilities of Chicago, preferred	6	70	70
Northern States Power of Chicago, common	7	96	93
Northern States Power of Chicago, preferred	7	97	96
Pacific Gas & Electric of San Francisco, common	5	56	55
Pacific Gas & Electric of San Francisco, preferred	6	88	88
Public Service of Northern Illinois, Chicago, common	7	93	94
Public Service of Northern Illinois, Chicago, preferred	6	98½	98½
Republic Railway & Light of Youngstown, common	4	35½	32½
Republic Railway & Light of Youngstown, preferred	6	67½	65
Standard Gas & Electric of Chicago, common	..	9½	9½
Standard Gas & Electric of Chicago, preferred	6	34	35
Tennessee Railway, Light & Power of Chattanooga, common	..	5½	6
Tennessee Railway, Light & Power of Chattanooga, preferred	6	28	30
United Light & Railways of Grand Rapids, common	4	38	38
United Light & Railways of Grand Rapids, preferred	6	68	67
Western Power of San Francisco, common	..	14	14
Western Power of San Francisco, preferred	6	54	53
Western Union Telegraph of New York	extra	94¼	93⅞
Industrials—			
Electric Storage Battery of Philadelphia, common	4	60	61
General Electric of Schenectady	8	157	157½
National Carbon of Cleveland, common	8	74	73¾
National Carbon of Cleveland, preferred	..	133	133
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	50½	50
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	63	63

stock, and after payment of 8 per cent dividends on the stock, added $10,467,882 to its surplus, making a total surplus of $34,100,753.

The Public Service Commission of Massachusetts has approved a 6-cent fare for the Bay State Street Railway of Boston. The final schedule of rates as amended provides that the company will sell twenty tickets for $1 instead of nine tickets for 50 cents, as originally asked. Such tickets will be good at all times, except on Saturdays after 1 p. m. and on Sundays and holidays. The company's request for the right to charge 1 cent for each transfer was eliminated. Instead, a sort of modified zone system has been established on certain lines. In its original application the Bay State claimed that it needed $1,400,000 of additional annual revenue in order to meet expenses, provide for depreciation and show 6 per cent earned on the property investment. It is estimated that the change to a 6-cent fare basis will provide $720,000 of additional revenue, or a trifle over half of what was first asked for.

Reports of Earnings.

GENERAL GAS & ELECTRIC.

The combined earnings of the Niagara, Lockport & Ontario Power Co. and the Salmon River Power Co. for May, 1917, are reported as follows: Gross, $201,686; net after paying expenses, $103,404; other income, $1,407; total net income, $104,811.

Northern Ohio Traction & Light Company's May earnings as follows: Gross, $532,733; net after expenses, $207,087.

Subsidiary companies of the General Gas & Electric Company report for the five months ended May 31, as follows:

	1917.	1916.
Operating revenues..	$1,283,329	$1,161,496
Operating expenses and taxes	943,596	755,917
Operating income...	339,733	405,579

AMERICAN PUBLIC UTILITIES.

	Years ended April 30, 1917.	June 30, 1916.
Gross	$3,703,326	$3,309,586
Net after taxes	1,626,902	1,466,785
Other income	97,195	81,744
Total net	$1,724,098	$1,548,528
Net after charges.....	$ 462,741	$ 395,073
Preferred dividends....	247,619	234,840
Balance	$ 215,122	$ 160,233

DETROIT EDISON.

	1917.	1916.
May gross	$ 962,630	$ 761,863
Net after taxes.....	280,154	271,265
Surplus after charges..	196,028	185,141
Five months' gross....	5,128,735	4,133,520
Net after taxes.....	1,737,626	1,641,879
Surplus after charges..	1,313,825	1,181,258

Electrical Patents Issued June 26, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,230,834. **Mechanism for Unloading Compressors for Starting.** B. S. Aikman, assignor to National Brake & Electric Co., Milwaukee, Wis. Load is removed from motor driving compressor at starting by special valve arrangement.

1,230,835. **Telephone-Exchange System.** G. Babcock, assignor to Telchronometer Co., Rochester, N. Y. Arrangement of meters at substations.

1,230,840. **Means for Facilitating Starting of Gas-Engines.** Charles H. Belknap, Brooklyn, N. Y. Has electric heater for air intake of carburetor.

1,230,844. **Device for Arresting Light-Rays.** F. M. Blair and F. M. Black, Newark, Ohio. Semitransparent tube projecting inwardly from front glass intercepts direct rays from lamp mounted at focus of reflector of headlight.

1,230,848. **Electric-Light Socket.** T. A. C. Both, assignor to Zee-Socket & Mfg. Co., Boston, Mass. Has a switch operated by two push buttons.

1,230,857. **Electromagnetic Vibrator.** F. E. Brixius, assignor to Manitowoc Electric Implement Co., Manitowoc, Wis. Structure of electromagnet having plunger actuated by a spring and magnetism to give a series of taps.

1,230,869. **Method of Making Incandescent Lamps.** W. D. Coolidge, assignor to General Electric Co. Manner of mounting a continuous, brittle tungsten filament.

1,230,874. **Metallic Audion.** L. de Forest, assignor to De Forrest Radio Telephone and Telegraph Co., New York, N. Y. Comprises an evacuated metal shell forming one electrode and a glass stopper carrying other two electrodes.

1,230,878. **Apparatus for Illuminated Displays.** H. Dumars, New York, N. Y. Advertising device.

1,230,879. **Illuminated Display Device.** H. Dumars and G. Dumars, New York, N. Y., said G. Dumars assignor to said H. Dumars. Has designs outlined by perforations and also by arrangement of light reflecting and absorbing surfaces.

1,230,880. **Assembly Voting Machine.** F. L. Dyer, Montclair, N. J. A single recording device is electrically operated from several transmitters.

1,230,884. **Telephonic Apparatus.** C. Forgues, assignor to Societe de Lavandeyra & Orner, Paris, France. Special structure of microphone and receiver with disinfectant.

1,230,900. **Electromagnetic Valve-Grinder.** C. A. Hink, Grinnell, Iowa. Arrangement of motor drive and magnetic bit.

1,230,903. **Block-Signal System.** M. R. Julian, assignor to J. Signal Co., Birmingham, Ala. Has train-carried brake and signal control apparatus controlled by track devices.

1,230,905. **High-Frequency Therapeutical Apparatus.** W. Kleinberg, New York, N. Y. Special structure of induction coil and vibrator.

1,230,925. **Mechanism for Unloading Compressors for Starting.** W. J. Richards, assignor to National Brake & Electric Co., Milwaukee, Wis. Modification of 1,230,834.

1,230,934. **Alternating-Current Electromagnetic Control-Switch.** J. T. Skinner, Lawrence, Kan. Structural details.

1,230,935. **Electric Braking System.** J. T. Skinner, Lawrence, Kan. System of controlling motors to act as braking generators.

1,230,942. **Illuminating Device.** A Sundh, Hastings-on-Hudson, N. Y. Door knob lighted by battery lamp.

1,230,943. **Portable Light.** A. Sundh, Hastings-on-Hudson, N. Y. Battery and lamp support for attachment to the hand.

1,230,945. **Automatic Blocking Mechanism for Strip-Mills.** A. Sundh, Hastings-upon-Hudson, N. Y. Mechanism for winding strip driven by a polyphase motor electrically controlled by the feed of the strip.

1,230,946. **Portable Switchboard.** G. Thompson, assignor to the Autocall Co., Shelby, Ohio. Structural details.

1,230,955. **Maximum Cut-out.** G. J. Van Swaay, Delft, and H. I. Keus, Hengelo, Netherlands. Structure of magnetically operated switch.

1,230,956. **Microphone.** A. Vaugean, A. de Lavandevra, and W. Garthwaite, Paris, France. Details of microphone cell for telephony.

1,230,957. **Electric Signaling Device for Automobiles.** G. F. Voight, San Francisco, Cal. Structure of contact device on steering wheel.

1,230,983. **Electric Pull-Socket.** F. Barr, New York, N. Y. Structure of porcelain body.

1,230,996. **Telephone System.** E. E Clement, assignor to J. R. Garfield, Cleveland, Ohio. Automatic.

1,231,006. **Liquid-Dispensing Apparatus.** D. W. Flint, Cranston, R. I. Has a float-controlled, electrically operated pump.

1,231,008. **Electrical Installation,** F. W. Funk, Youngstown, Ohio. Grounding gap for high-tension discharge; has low-tension circuit containing a telltale across gap, the low tension maintaining circuit across the gap after a high-tension discharge.

1,231,013. **Automatic Telephone-Exchange System.** C. L. Goodrum, New York, N. Y. Arrangement and operation of finder switches.

1,231,024. **Telephone-Exchange System.** E. E. Hinrichsen, assignor to Western Electric Co. Arrangement of relays for controlling signal in link circuit of a manual system.

1,231,033. **Elevator Signaling System.** W. A. Loomis, Los Angeles, Cal. Signal circuit is closed when cars move out of predetermined relative positions.

1,231,036. **Refillable Cartridge-Fuse.** C. T. McDonald, Chicago, Ill. Structural details.

1,231,043. **Ignition System.** C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Structure and arrangement of interrupter.

1,231,045. **Methane Detector.** C. M. Means, assignor of two-thirds to W. A. McCutcheon, Pittsburgh, Pa. Gas is detected by comparison of electric glowers, one of which is affected by gas and the other not.

1,231,048. **Electrical Relay.** E. O. Moller, Brooklands, England. Arrangement of resistors and winding for an overload and reverse current relay.

1,231,056. **Electric Iron.** C. S. Palmer and D. Palmer, Saranac Lake, N. Y. Heating current is automatically controlled by handle when in use.

1,231,057. **Dry-Cell Battery.** H. R. Palmer, Cleveland, Ohio. Zig-zag zinc strip has perforations through which the other electrode extends.

1,231,063. **Electrical Receptacle.** C. D. Platt, Bridgeport, Conn. For lamp bases, etc.

1,231,068. **Insulator-Support for Cross-Arms.** C. C. Saylor, Pittsburgh, Pa. Frame for clamping about arm and carrying pins for insulators.

1,231,071. **Electrically-Operated Tool.** F. Schneider, assignor to Van Dorn Electric Tool Co., Cleveland, Ohio. Details of motor housing and gearing of hand drill.

1,231,081. **Air-Brake System.** J. R. Snyder, assignor to P. E. Donner, Pittsburgh, Pa. Arrangement of magnets for valve control.

1,231,084. **Apparatus for Producing Zinc and Other Similar Metals.** H. Specketer, Griesheim-on-the-Main, Germany. Structure of rotary electric furnace.

1,231,085 and 1,231,086. **Telephone-Exchange System.** A. B. Sperry, assignor to Western Electric Co. Automatic.

1,231,090. **Suspension Means for Strain-Insulators.** L. Steinberger, Brooklyn, N. Y. Details of two-part connecting members. (See cut.)

1,231,095. **Telephone-Transmitter.** N. Tannaka, New York, N. Y. Structure of microphonic contacts.

1,231,109. **Automatic Synchronizer.** J. G. Zimmerman, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Reed armature causing connection of generator and line when vibrated at its natural period, is subjected to currents of generator and line, its natural period corresponding to the action to which it is subjected when the generator and line are in synchronism.

1,231,125. **Lock for Automobiles.** C. N. Cahusac, assignor to Duplex Lock Co., Inc., New York, N. Y. Brakes are locked set by a solenoid-controlled lock.

1,231,126. **Generator for Intermittent Electric Currents.** J. Carter, assignor to Carter-Long Magneto Co., Waukegan, Ill. Structure of magneto.

1,231,140. **Telegraph System.** A. F. Dixon, assignor to Western Electric Co., Inc., New York, N. Y. Structure of current distributer.

1,231,149. **Ignition Mechanism for Internal-Combustion Engines.** H. F. Geist, assignor to Webster Electric Co., Racine, Wis. Gearing, etc., of magneto having an oscillating rotor.

1,231,169. **Circuit Breaker for Block Signal Systems.** M. P. Julian and J. V. Morris, assignors to Julian-Beggs Signal Co., Terre Haute, Ind. Train-operated track instrument.

1,231,179. **Signaling Device.** J. P. McBride, assignor to Carl M. Lovsted, Seattle, Wash. Solenoid-operated steam whistle.

1,231,193. **Electromagnet.** C. C. Powers,

assignor of one-third to J. T. Utnik and one-third to L. De Bold, Williams, Ariz. Manner of winding annular tubular bobbin having a slot in one side to admit actuated arm to connection with flanges.

1,231,196. Radiant-Type Stove. W. A. Rankin and H. D. Larway, assignors to Hotpoint Electric Heating Co., Ontario, Cal. Has a fluid-cooled reflector.

1,231,200. Electrical Timing Device. E. H. Rollinson, Lyons Farms, N. J. Arrangement of heating coil for timing a circuit breaker.

1,231,202. Insulating-Joint. F. D. Saylor, Pittsburgh, Pa. For pipes.

1,231,212. Electropneumatic Organ. F. W. Smith, North Tonawanda, N. Y. Electrically operated instrument is controlled by tracker board and sheet and electrically controlled stops.

1,231,221. Electric-Current Interrupter. K. Trosdahl, Christiania, Norway. Mercury contacts are opened by pressure of gas expanded in a closed chamber by a hot wire when limit of current consumption has been reached.

1,231,229. Motor-Starting Switch. C. A. Ahlstrom, assignor to the Trumbull Electric Manufacturing Co., Plainville, Conn. Structural details.

1,231,230. Trolley-Wire Support. C. N. Allerding, Mansfield, Ohio. Structure of jaw hanger for 8 wire.

1,231,244. Semaphore-Arm. W. A. Dunlap, Pittsburgh, Pa. The opaque, light-reflecting, signal-giving surface is longitudinally interrupted and disposed at different angles to the line of vision.

1,231,245. Mounting for Electric Vibrators. C. E. Endorf, Jr., assignor to Lindstrom-Smith Co., Chicago, Ill. Details of motor-operated hand implement.

1,231,264. Ignition Device. C. F. Kettering, assignor to the Dayton Engineering Laboratories Co., Dayton, Ohio. Has a magnetic circuit breaker to give one or a series of breaks independent of the timer, and arrangements for controlling the same.

1,231,265. Control for Electrical Systems. C. F. Kettering, assignor to the Dayton Engineering Laboratories Co., Dayton, Ohio. Resistance is varied by causing a resistor to be more or less immersed in a conducting liquid operated by the plunger of a regulating solenoid.

1,231,266. Engine-Starting Device. C. F. Kettering, assignor to the Dayton Engineering Co., Dayton, Ohio. Connections of a motor-generator geared to engine, and a storage battery.

1,231,268. Circuit-Controller. G. C. Knauff, Chicago, Ill. Rotatable plug switch for controlling headlight lamps.

1,231,271. Electromagnetic Switch. F. Kratz, assignor to the firm of Robert Bosch, Stuttgart, Germany. Structural details

1,231,273. Insulating-Cap for Conduits. C. M. Lefkowitz, New York, N. Y. Details of perforated cap to fit on end of conduit. (See cut.)

1,231,298. Signaling Device. S. Reinker, assignor to the Liberty Bell Co., Cleveland, Ohio. Electromagnetic gong and lamp.

1,231,319. Automatic Telephone System. C. S. Winston, assignor to Kellogg Switchboard and Supply Co., Chicago, Ill. Circuit connections and relay arrangements.

1,231,334. Sorting-Machine. G. W. Cox, Jr., Kensington, Md. Electromagnetically operated machine has bodily movable receiver having compartments selectively presented in operative relation to a feeding means.

1,231,335. Electric Incandescent Lamp. J. H. Dale, assignor to Dale Lighting Fixture Co., Inc., New York, N. Y. Has special ventilating structure for securing base to neck of bulb.

1,231,337. Lighting-Fixture. J. A. Dempsey, New York, N. Y. For indirect lighting.

1,231,361. Signal Device for Motor-Vehicles. J. H. Hunt, assignor to Packard Motor Car Co., Detroit, Mich. Lights are controlled by a selector switch, and the selected circuit is intermittently closed by a vehicle-operated switch.

1,231,362. Engine-Starter System. J. H. Hunt, assignor to the Dayton Engineering Laboratories Co., Dayton, Ohio Gearing of motor with engine.

1,231,364. Inclosed Safety-Fuse. H. M. Huxley, assignor to Economy Fuse & Mfg. Co., Chicago, Ill. Structural details.

No. 1,231,090.—Suspension Insulator.

1,231,367. Electric Switch. E. H. Jacobs, assignor to General Electric Co., New York, N. Y. Details of toggle-operated structure.

1,231,379. Swivel Attachment-Plug. O. Kessler, Passaic, N. J. Details of construction.

1,231,403. Switch-Operating Device. J. M. Mallory, New Geneva, Pa. For mounting on steering post of automobile for operating ignition switches.

1,231,412. Electromagnetic Switch. E. J. Murphy, assignor to General Electric Co., New York, N. Y. Spring tending to hold contacts open has special leverage connection therewith.

1,231,413. Trolley-Contactor. C. H. Murrell, Roanoke, Va. Structure of switch mounted on trolley wire and operated by passing wheel.

1,231,416. Manufacture of Incandescent Lamps. H. H. Needham, assignor to General Electric Co., New York, N. Y. Capsule containing a zetter is sealed in a bulb and then broken.

1,231,417. Attachment-Plug Receptacle. A. H. Nero, assignor to the Arrow Electric Co., Hartford, Conn. Structural details.

1,231,456. Electric-Lamp Socket. G. B. Thomas, assignor to the Bryant Electric Co., Bridgeport, Conn. Details of terminal structure and mounting.

1,231,489. Spark-Gap. C. E. Campbell, Lynn, Mass. Comprises a pair of stationary electrodes and an adjustable rotatable disk as the other electrode, with special provision for heat radiation.

1,231,494. Neon-Tube. G. Claude, Boulogne-sur-Seine, France. An electric lamp comprising two neon tubes grouped together and in series in a high-tension circuit, one of the tubes containing a few drops of mercury.

1,231,516. Phantom Loading-Coil. W. Fondiller, assignor to Western Electric Co., Inc., New York, N. Y. A loading unit adapted for use with two physical circuits and a derived phantom circuit.

1,231,528. Generator for High-Frequency Currents. P. O. Pedersen, assignor to Federal Telegraph Co. An oscillation circuit having several discharge spaces, and a high-frequency current is directed through the circuit and successively and periodically directed through said spaces at periods which are a simple multiple of the high-frequency current.

1,231,529. Variable-Speed Gearing. G. Pollard, assignor to Menco-Elma Syndicate, Limited, London, England. Comprises planetary gears controlled by electromagnetic brakes.

1,231,537. Call System. T. J. Murphy and E. Miller, Rochester, N. Y. Arrangement whereby a lamp at a calling station indicates whether or not a bell at a called station is cut out.

No. 1,231,273.—Insulating Cap for Conduits.

1,231,540 and 1,231,541. Railway Signaling System. H. A. Wallace, assignor to the Union Switch & Signal Co., Swissvale, Pa. Block systems for single-track roads.

Patents Expired.

The following United States electrical patents expired on July 3, 1917:

652,748. Manufacture of Electrical Fuses or Current Arresters. F. A. Cote, Ottawa, Canada.

652,753. Electrical Time Recorder. E. Davis, Boston, Mass.

652,754. Register. E. Davis.

652,761. Electrolytic Production of Caustic Soda, etc. Justus B. Entz, Philadelphia, Pa.

652,775. Alternating-Current Regulator. D. O. Hull, Port Clinton, O.

652,806. Flexible Electrical Conduit. H. G. Osburn, Chicago, Ill.

652,846. Process of Purifying and Strengthening Brine for Use in Electrolytic Cells. J. Hargreaves, Farnworth-in-Widnes, England.

652,856. Speed Governor for Electrical Controllers. J. H. McGurty, Jersey City, N. J.

652,875. Electric-Clock Pendulum. E. K. Adams, New York, N. Y.

652,934. Electrical Device for Indicating the Awakening of Persons Buried Alive. W. J. McKnight, Buffalo, N. Y.

652,952. Magnetoelectric Motor. E. M. Andrews and M. N. Andrews, Des Moines, and C. M. Conger, Adel, Iowa.

652,990. Electric Transformer. J. J. Wood, Fort Wayne, Ind.

653,038. Incandescent Electric Lamp. J. Plechati, Berlin, Germany.

653,068. Electric Lamp Socket. W. A. Church, Pittsburgh, Pa.

653,087. Electric Controller. S. W. Huff, Baltimore, Md.

653,088. Apparatus for Exciting Alternating-Current Dynamoelectric Machines. M. Hutin and M. Leblanc, Paris, France.

653,089. Exciter for Alternating-Current Dynamoelectric Machines. M. Hutin and M. Leblanc.

653,093. Apparatus for Supplying Currents of Predetermined Voltage from Main Lines of Higher Voltage. W. W. King, Huntsburg, O.

653,150. Electric Headlight Lamp. H. P. Wellman, Ashland, Ky.

653,167 to 653,172, inclusive. Motor Vehicle. C. J. Coleman, Chicago, Ill.

653,199. Motor Vehicle. J. H. Munson, Chicago, Ill.

The following United States electrical patents expired July 10, 1917:

653,218. Motor Controller. D. H. Darrin, Cranford, N. J.

653,221. Electric-traction Balloon. M. J. A. Deydier, Lyons, France.

653,516. Trolley. W. H. Russell, Watertown, Mass.

653,319. Supervisory and Busy-test Appliance for Telephone Lines. C. E. Scribner, Chicago, Ill.

653,342. Diamagnetic Separation. E. Chevy Chase, Md.

653,343. Electrostatic Separation. E. Gates, Chevy Chase, Md.

653,344 and 653,345. Diamagnetic Separation. E. Gates.

653,346. Magnetic Separation. E. Gates.

653,422. Telephone-test Set. A. C. Ludington, Marquette, Mich.

653,424. Speed-equalizing Device. A. D. Lunt, Schenectady, N. Y.

653,448. Reel or Spool for Electric Thermostatic Cables. J. D. Gould, New York, N. Y.

653,469. Electric Signaling Apparatus. H. G. Carleton, New York, N. Y.

653,470. Self-starter for Electric Motors. H. H. Cutler, Chicago, Ill.

653,471. Controller for Dynamo-electric Machines. H. H. Cutler.

653,472. Controller for Dynamos or Generators. H. H. Cutler.

653,530. Voltaic Cell. C. T. Richmond. Cleveland, O.

653,531. Machines for Grinding Carbon Diaphragms. C. T. Richmond and M. M. Zellers, Cleveland, O.